THE MARINE REVIEW

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PUMP DREDGE FOR SAVANNAH RIVER.

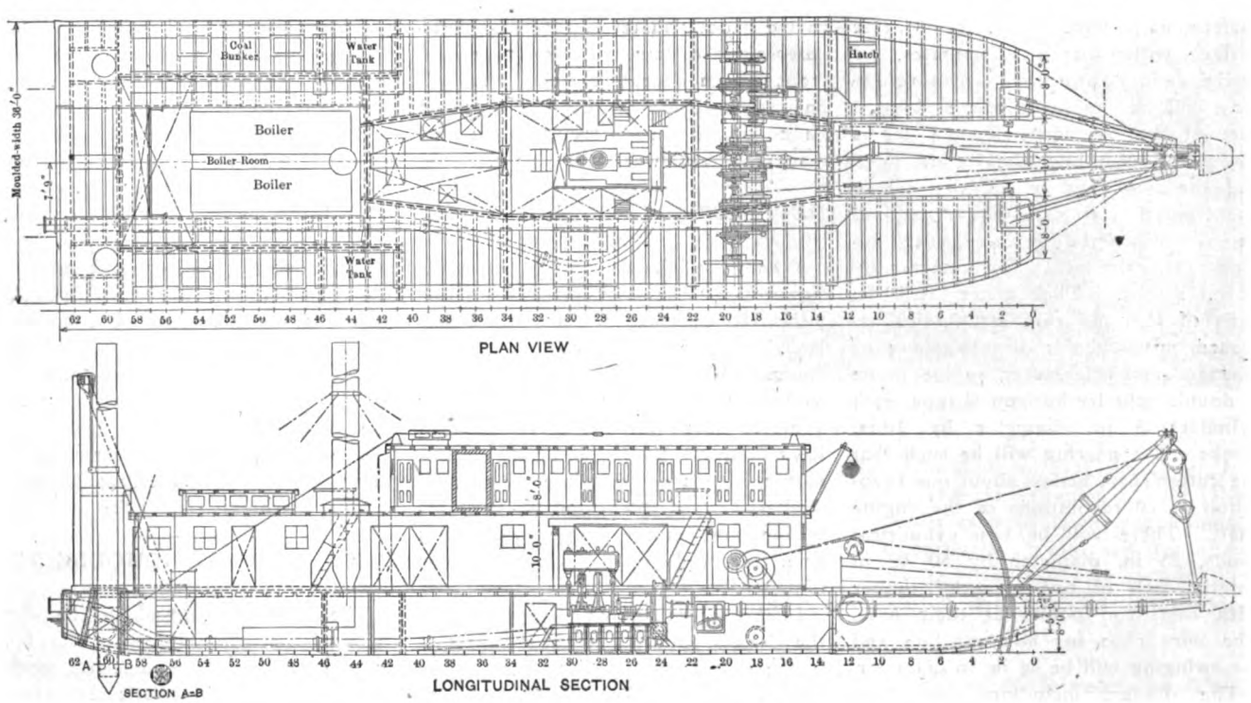
Bids were recently opened by Maj. J. C. Sanford, government engineer, Philadelphia, for the construction of a steel hull 16 in. pump dredge for Savannah river. The contract was awarded to the Ellicott Machine Co., Baltimore, Md., upon its bid of $117,700.

The general dimensions of the dredge will be: Length over all, 126 ft.; molded beam, 36 ft.; molded depth, 8 ft. The hull will be of steel, and will have two longitudinal and five transverse bulkheads. The forward transverse bulkhead will be in line with and form the after end of the well.

The propelling machinery will consist of one reversible double-cylinder engine, with cylinders 12 in. diameter by 16-in. stroke, and will be installed in the stern of the dredge. The propeller will be 4 ft. in diameter, and of 3 or 4 ft. pitch. The pumping engine will be a vertical, direct-acting, compound engine, with cylinders 14½ and 32 in. diameter by 16-in. stroke, to run at a normal speed of from 190 to 200 revolutions per minute. The crank pits of the pumping engine will be enclosed, forming receptacles for oil. A piston valve will be fitted to the high-pressure cylinder, and a double-ported slide valve to the low pressure.

The condenser shell will be of steel with cast iron heads, the tubes to be of solid drawn brass and ⅝ in. in diameter. They will have 900 sq. ft. of cooling surface. A direct-driven centrifugal pump will supply the circulating water. There will be one twin-cylinder, double-acting air pump, with steam cylinders 10 in. diameter, and water cylinders 16 in. diameter by 12-in. stroke. The feed pump will be duplex, with cylinders 4 and 8 in. diameter, by 8-in. stroke. The fire pump will have cylinders of 8 and 12 in. diameter by 12-in. stroke. The water service pump will be similar in design to the others, with cylinders 4 and 6 in. diameter by 6-in. stroke.

The boiler installation will consist of two locomotive type boilers, each to have about 1,000 sq. ft. of heating



LONGITUDINAL SECTION AND PLAN VIEW OF DREDGE FOR SAVANNAH HARBOR.

NEW MOTOR BARGE FOR THE NAVY.

surface, and about 30 sq. ft. of grate surface, with tubes 3 in. diameter.

The main hoisting and swinging engine will be mounted in the forward part of the dredge, and have drums for each breast line, the ladder hoist, and the two spud lifts. The engine operating the lay shaft and drum will be a horizontal double-cylinder engine with cylinders 8 in. diameter by 12-in. stroke. The cutter will be built of bar and cast steel, with attached cutter blades of manganese or manard steel, the cutter engine to be of double-cylinder horizontal type, with cylinders 8 in. diameter by 10-in. stroke. The gearing will be such that the cutter shaft makes about one revolution to 20 revolutions of the engine shaft. There will be two cylindrical spuds, 26 in. diameter by 50 ft. in length, each of one piece of timber with cast iron points at their base. The wire rope for hoisting line and for swinging will be ¾ in. in diameter.

The dredge, including spud lifts, swinging lines, ladder hoist, and winch and cutter engines, will be operated from the operating room. Levers from the friction clutches and brakes will be mounted therein in convenient positions. In this room, also will be put vacuum and pressure gages from the pump.

The electric installation will consist of one 10-kilowatt, 100-volt generating set, the engine and generator to be direct connected. Three separate circuits will be run; one for arc light, one for the lower house, engine and boiler rooms, and one for the lamps in the upper quarters. One 2,000 candlepower arc lamp will be mounted in front of the operating room, and will have a hood and reflector to keep the light out of the operating room and distribute it forward and down.

NEW MOTOR BARGE FOR THE NAVY.

When the United States battleship Connecticut, the flagship of Rear Admiral Robley D. Evans, "Fighting Bob," left the Brooklyn navy yard in August to coal up for her long cruise to Pacific waters, she carried with her a motor barge for the private use of Rear Admiral Evans, equipped with a motor furnished by the Brownell-Trebert Co., of Rochester, N. Y. This is the first motor barge which has been accepted by the United States navy.

In the accompanying photo is shown the Connecticut, and in the foreground is the motor boat and its crew. The photograph was taken by Mr. Brownell just after the Connecticut left the dry dock at the navy yard. Of the Dolphin model, the motor barge was built at the Norfolk navy yard. She has been thoroughly tested and the rear almiral personally expressed his satisfaction with the boat. It is 40 ft. long, with a beam of 5 ft. 6 in. The hull is of cedar with a strip for a fender board. The deck is of mahogany and all of the appointments of the barge are in accord with the rank of the man who will make use of her, the active head of the American navy.

Capable of a speed of 19.7 knots, or approximately 22 miles an hour, the motive power is furnished by a Brownell-Trebert 4-cylinder motor of the 4-cycle type, having 6¾-in. bore and 6-in. stroke, developing 75 H. P. at 900 R. P. M. Just aft of the engine room is a gasoline tank of a capacity of 110 gallons, counter-balance slings are attached for hoisting, with hooks aft, amidships and forward, and side hooks amidships. There are individual canopies for the stern sheets, engine room and cockpit. There is a speaking tube from the stern sheets to the cockpit for the transmission of orders to the pilot.

The barge carries a crew of five men; coxswain, engineer, machinist and ordinary seaman.

TEST OF WESTINGHOUSE TURBINE.

The rapidity with which the steam turbine has come into popular favor is one of the phenomena of modern steam engineering. It is less than a decade ago since the first turbine was sold in the American market, but there are today about 700 in use throughout the country, aggregating a total capacity of approximately 1,000,000 K. W. or about 1,500,000 H. P. This wonderful demand for that novel prime mover is, of course, easily explained by the many advantages the turbine has over the reciprocating steam engine. An interesting test was conducted recently by the engineers of the New York Edison Co. at the Waterside station near Thirtieth street, which developed facts hitherto unattained

by any steam prime mover in this country. The unit under test was a Westinghouse turbine of 10,000-H. P. capacity. It had been sold under a steam consumption guarantee of 15.9 lbs. of steam per kilowatt hour, but the test recorded the phenomenally low steam consumption of a shade less than 14.9 lbs. per kilowatt hour. Apart from the fact that this result gained a bonus for the Westinghouse turbine of over $25,000, it is of the utmost interest to all users of steam engines as an illustration of the lowest record for steam consumption which has ever been recorded by a stationary steam engine. This steam consumption figures less than 1½ lbs. of coal per kilowatt hour and graphically illustrates the great advance in modern power plant practice attained through the introduction of the steam turbine efficiency to the reciprocating engines as to practically supplant them altogether.

STEAM LIGHTER NEW ENGLAND.

Quincy, Mass., Oct. 25.—The steel, steam lighter New England, built by the Fore River Ship Building Co. for the New England Steamship Co., made a most satisfactory showing today on her builders' trial. She is a sturdy vessel, built for hard service and her towing bitts, bulwarks, ice guards, and, in fact, all her ship carpenter work, is very heavy. She ran up to Boston, then turned and put out to sea as far as Harding's Ledge, and then came back to the Fore River yard. During the four-hour run from 11 a. m. to 3 p. m. she developed a speed of 11.3 statute miles per hour and maneuvered very handily.

F. O. Wellington, assistant to president of the Fore River Ship Building Co., was in charge during the trial trip, with Port Capt. T. E. Evans in the pilot house and an engine room force of Fore River men under the direction of Engineer J. P. Paige. The owners were represented by J. Howland Gardner, marine superintendent of the New England Steamship Co. and his assistant Wm. S. Rogers.

The New England was contracted for on March 5, 1907, and was completed six weeks before the time stipulated. She is a first class steel, steam lighter of modern type and is of these dimensions: Length over all, 130 ft.; extreme beam, 31 ft. 6 in.; depth molded at center, 13 ft. 6 in.; gross tonnage, 417 tons; net tonnage, 265 tons.

The New England has one heavy Oregon pine mast, 68 ft. to the top of the truck, and a boom 55 ft. long. She has one 7-in. by 10-in. twin drum hoisting engine and all gear is designed for seven tons. The propelling engine is direct acting, with cylinders 26 in. in diameter and 26 in. in stroke of piston, making 100 revolutions per minute. Steam is provided by two horizontal return tubular boilers, each 66 in. in diameter by 14 ft. long, with a grate area of 70 sq. ft. The propeller is four bladed, cast solid, with a diameter of 7 ft. 6 in. and a pitch of 10 ft. 6 in. The smokestack is 40 in. inside diameter and the outside stack measures 50 in. in diameter. The deck house contains the pilot house, rooms for the captain and mate, and the galley is at the extreme after end. She has three water-tight bulkheads. In the main deck forward is a hatch 8 ft. 3 in. square. She is equipped with a Blake duplex donkey pump, a Williamson steering engine, a metallic life boat and axes, fire extinguishers and all other appliances required by law.

STEAM LIGHTER NEW ENGLAND.

ANOTHER LINER—CALIFORNIA.

The Glasgow correspondent of the *Shipping Gazette* says: With the sailing on Saturday, Oct. 12, of the new steamer California, the Anchor line will be one stage nearer the perfect weekly service to and from New York for which they have been striving since 1899. They have now only one slow boat—the Furnessia—in the four which carry on their New York service, and it is practically certain that in a year or so she, too, will be superseded. The completion of the California illustrates very forcibly the evolution process that is continually going on in the designing of ships. She is a little smaller than the Caledonia, but she actually carries more passengers. Besides, the space allocated to second class is larger and that allocated to first class smaller. It is a case of designing a boat to fit as closely as possible the requirements of a particular trade, and the more boats the firm build the nearer they get to the ideal boat for their service.

Capt. John McDermott, of Tonawanda, widely known in marine circles, died quite suddenly at the Riverside Accident hospital at Buffalo. Death was due to cerebral hemorrhage, following a stroke of paralysis at his home a week or more before. An injury to his head received in a recent fall into the hold of his boat and the anxiety caused by his wife's serious illness at the Buffalo general hospital are believed to have induced the stroke. Besides his wife, Capt. McDermott is survived by two daughters and two brothers. During 1896-97 he was chief of the Tonawanda police.

AMERICAN BOILER MANUFACTURERS' ASSOCIATION

The nineteenth annual convention of the American Boiler Manufacturers' association was held at Atlanta, Ga., on Oct. 8 and 9. The discussion at the convention was largely on the subject of marine boiler inspection and was therefore of great interest. The following officers were elected: President, M. F. Cole, Newman, Ga.; first vice president, T. M. Rees, Pittsburg, Pa.; second vice president, J. D. Smith, Charleston, S. C.; third vice president, W. A. Brunner, Phillipsburg, Pa.; fourth vice president, H. D. MacKinnon, Bay City, Mich.; fifth vice president, M. A. Ryan, Duluth, Minn.; secretary, J. D. Farasey, Cleveland; treasurer, J. F. Wangle, St. Louis, Mo.

In presenting a verbal report for the committee on materials Capt. Rees, in the absence of Chairman Meier, stated that it was very difficult to obtain proper boiler plate to pass the United States boiler inspection requirements, that all of the mills in Pittsburg had refused to make this steel but one, and that one mill has successfully made it within the last few weeks. From all that Capt. Rees could learn, he understood that the steel mills had been endeavoring to make boiler plates too cheaply and in order to do this have been using inferior scrap. One mill in a recent heat, made entirely by the acid process instead of the basic process, and by using entirely new material, did not lose one sheet in the heats that it made and has filled all of the orders outstanding on its books. The speaker had an order in one mill for over six months and believed that it was true that the mills are trying to furnish plates cheaper than the users of the plate desire, and have been trying to get out quantity instead of quality. He emphasized the fact that those who use boilers in his section of the country do not want a cheap or inferior quality of steel, but would be willing to pay a good price for steel equal to what was formerly furnished the trade if they could be allowed under the marine laws a steam pressure in accordance with the quality used. Capt. Rees stated that one mill in Pittsburg is now making under the acid process steel that will meet all requirements of the United States marine law and that he had gotten a wagon load of it the day before he left home. The speaker believed that, if the mills are not too badly rushed will put good material in the heats, they will be able to get a boiler plate entirely satisfactory to the boiler manufacturers, and such as has not been had for many years.

MARINE BOILER INSPECTION.

M. A. Ryan did not believe that the association for years to come could obtain a thorough repeal of the laws covering marine boiler inspection. Practically all the work done by him is marine work and he experiences a great deal of trouble to meet the requirements of the present laws. The mills absolutely refuse to roll plate under the old specifications, and he has orders in for six months and no sign of plate yet. He was surprised to learn that any manufacturer would try to get an inferior grade of plate for the manufacture of marine or any other boilers and as an inferior steel will jeopardize life and property, the speaker did not believe that the manufacturers ought to supply such inferior steel even if a demand is made for it. Mr. Ryan commented unfavorably on the lack of qualifications on the part of some boiler inspectors, who were endeavoring to perform that duty which they were incapable of performing properly by reason of their ignorance of the subject. The local inspectors in his district were good, honest, square fellows and their chief was a very practical man who had served his time in a machine shop, was an old engineer, and a man who would listen to reason; but it was simply an impossibility to manufacture boilers and comply with the existing marine boiler inspection laws which are full of manifest contradictions and absurdities; and if a boiler could be made under such requirements, it would not then pass inspection under the Hartford rules. He could not understand why regulations that are so absurd and detrimental should be permitted to remain in force. He did not understand why the mills could not furnish the quality of material demanded by boiler manufacturers if the boiler manufacturers are willing to pay for it.

MR. W. L. HIRSCH'S TALK.

President Cole invited W. L. Hirsch of the American Steel & Wire Co. to address the convention in this connection. Mr. Hirsch said that he had been a seller of boiler plate for 25 years, located quite close to the mills and possessing some knowledge of chemistry and the physical properties of steel. For 20 years his concern had made contracts with the leading railroads of the United States for fire box and boiler steel, subject to the most rigid chemical and physical requirements in specifications of any steel that it produced, not excepting that for the United States government. In earlier days, they produced crucible steel, which was then the only steel in existence and it is true that crucible steel is of superior quality, but the peculiarity of this steel is such that by reason of having to heat the metal in small pots, it is impossible to make large plates such as are demanded today, and in order to reduce the seams that are necessary for steam boat and locomotive boilers, have developed out of that process, and in this development, have gotten quantity at the expense of quality. It is now necessary to use the process that will produce plates of sufficient size to meet present demands of boiler manufacturers and users. This is found in the acid process. You cannot get out of the acid process any more than you put into it. The crucible is handled by a workman with tongs, and no larger pot can be used than the workman can thus handle and pour. The resulting ingot is of a comparatively small size and it is impossible under this process to make a large plate, say 1¼ in. thick and 60 to 100 in. wide and of necessary length because it would require too many pots and it would be impossible to preserve a uniform heat, which unless secured would result in an un-uniform physical product; on the contrary, however, by the acid process, a good quality of steel is produced when good materials are used, that is nearly equal to the steel produced by the crucible process. The speaker denied the truth of the statements made to the effect that steel manufacturers are employing an inferior quality. Scrap of a certain quantity is used alike in both the basic and acid process. It is a fallacy to maintain that in the basic open hearth process worn out or burnt up stuff, castings, tin cans, or anything that a goat cannot eat, is used. To determine the quality of boiler plate, it must be measured by chemical and physical requirements.

IMPRACTICAL SPECIFICATIONS.

Under the Bessemer process, are made rails, bars and all common steel products. Bessemer steel is made by blowing out impurities and sometimes under the Bessemer process they will produce the chemical and physical qualities of boiler plate. However, no reputable concern would ever use Bessemer steel for boiler plate because it would not give

the proper results and it would be dangerous to human life to employ it. The steel maker is not infallible, the speaker said, but endeavors to comply with the best specifications and to obtain the required chemical and physical results so long as they are within reasonable bounds. The American Steel & Wire Co. has always sought for quality instead of quantity. A year ago last July, the United States government asked this company to comply with certain specifications for marine steel, which the company declined to do because the specifications were impracticable, not because the company could not produce high quality steel; on the contrary, it has produced fire box and boiler steel of high class quality. The impracticable specifications referred to were possibly gotten up by men who did not understand the physical and chemical qualities of steel, and who required combined physical and chemical conditions which could not be practicably produced. An association representing all of the plate makers of the United States has frequently discussed all these conditions, and the speaker wrote to all plate makers in the United States requesting their views as to the new specifications of the government. A majority of those addressed replied that they would decline to consider orders under such specifications. This company is anxious to supply not only the boiler makers but the United States government with the product they require, but it cannot perform impossibilities. In this progressive age, when quantity is an urgent necessity and when the prices have been forced down from $5 per hundredweight to $1.70 per hundredweight, the same quality cannot be expected. The demand for common steel products is so extensive and insistent that we are compelled to give first attention to meeting this demand. The speaker was asked by an inspector of the Pittsburg district some time ago, "Hirsch, why don't you make marine steel plate?" and answered, "Because we cannot produce it without losing money. The specifications are impracticable." Talk is one thing, but performance is another, and the specifications of the United States government as they exist today are too drastic and impracticable. Surely a concern that has prided itself on quality for 25 years would not say that they cannot produce the material unless it is impracticable. The speaker contended that boiler plate that contains not to exceed 0.04 phosphorus and not to exceed 0.04 of sulphur, with the tensile strength regulated entirely by carbon, is a good steel; and when steel is produced that under test meets all of the specifications and was better than anything that was ever produced before, but is rejected because it shows a difference of not exceeding one per cent between coupons cut longitudinally and those, cut transversely, such rejection is unreasonable. Steel can be produced of a good quality, but we absolutely refuse to produce to fancy specifications, gotten up by impracticable men. Steel showing 25 per cent with elongation, a stretch of ¼ in 1 inch or 2 inches in 8 inches, is certainly a good steel. Another man may demand 26 per cent, another 27 per cent, and so on up to 30 per cent, at which point the steel manufacturers must stop. When a physician feels your pulse, he knows whether it is normal or otherwise, but there are many things in steel production that are mysterious and uncertain, so that it is impossible to guarantee absolutely perfect and uniform results at all times. The manufacturer cannot guarantee to you anything except to guarantee to comply with the physical and chemical qualifications. Continuing, the speaker said, that he was absolutely familiar with the process of steel making, from the crucible to the basic, and also with the chemical and physical specifications necessary to produce boiler plate, fire box and marine steel, and was confident that the manufacturers could not produce marine steel at 2 or 3 cents per pound and come out whole. Boiler manufacturers are right in enjoining upon the manufacturer that his steel must contain more than a certain amount of phosphorus, a certain amount of sulphur and certain amount of silicon; but the hardness and softness of steel are regulated entirely by the carbon. Tensile strength is not a question of quality but the hardness or softness given the proper elongation, ductility and minimum tensile strength, and you have ideal boiler steel. A tensile strength of 55,000 or 60,000 pounds with high elongation and ductility is better than 65,000 to 70,000 pounds tensile strength with less ductility and low elongation. When in use steel crystallizes and hardens and the speaker would prefer to risk his life and the lives of others who have to do with boilers with steel of the former rather than the latter kind. The speaker said that his company would not send out a plate that is not up to chemical and physical test, and this was not a bid for orders, but only fair to state in justice to his company that it would not jeopardize life for profit. He therefore begged of the boiler makers to kindly bear with the manufacturers and to consider his conditions and not to insist upon an absolute demand that was not practicable, but rather to consult with the manufacturers and endeavor to meet the mutual requirements.

CAPT. REES REPLIES.

Replying to the last speaker, Captain Rees said that he agreed with him that if the boiler manufacturer desired good steel he should pay for it. He had never experienced any trouble with crucible steel for fire box and locomotive boiler use, and for the best article was willing to pay the best price; but steel made by the crucible process is now prohibited by United States law. The speaker had protested against this prohibition and is so on record. Since the absorption of most of the plate manufacturers throughout the country by what is called the United States Steel Corporation and also the Crucible Steel Co., a great deal of competition in boiler plate has been cut out, but the speaker thought the day would come when new mills will arise to compete with these corporations and undoubtedly this will lead to the production of better boiler plate. With this in view, and in order to throw open the doors of competition, crucible steel for boiler plate should not be prohibited by the United States government. The speaker had submitted the physical proof before the department at Washington upon an occasion when a meeting of steamboat men and boiler manufacturers was called at the capital city. He took a test from a plate made in 1879 and placed it in comparison with a test from a plate made for a steamboat owned by the American Steel & Wire Co., and this comparison was submitted to Secretary Metcalf at that time, proving that the plate made in 1879 was still good, although the other had deteriorated from the heat to which it had been subjected by use in the boiler so that it was utterly worthless. The speaker said that neither the users nor boiler manufacturers have approved that the change made in the marine law which had been brought about by the plate manufacturers in conjunction with the supervising inspectors, who made some changes in the test pieces without changing the rules to correspond therewith. For five years efforts have been made to secure a change in the rules to correspond with the change in the test

pieces so as to allow the same steam pressure as formerly allowed. The speaker recently met a boiler inspector who showed him a test piece from a plate that he had recently tested, and had flattened it out at once with one blow of the hammer, and which on its face showed that it was a fine piece of steel and fully met the requirements. The inspector added that every piece pulled in that heat had passed satisfactorily the test required and that this steel was fully equal to the boiler plate made in years past. The speaker said that he was fully satisfied that the steel from which this test piece was taken indicated that there would be no more trouble hereafter in getting the plate that boiler manufacturers desired. He had since learned that this plate of steel was a heat that the steel maker had received instructions to make by the acid process using the very best materials and was informed that all that was needed was good material in order to make it properly by the acid process so as to fully meet all requirements. The speaker understood that it was not a question so much of cost with the manufacturers as it is a matter of detention and delays in getting material promptly.

REDUCING TENSILE STRENGTH.

Further answering the last speaker, Mr. Hirsch said that he would like the Boiler Manufacturers' Association to consider the matter of increasing the thickness of their boiler plate and reducing the tensile strength in order to give them the same power pressure, because it is easier to work a softer material of a thicker gage than to work a harder plate of a thinner gage. It seemed to the speaker that it would be better for the boiler manufacturer to employ a thicker plate of a softer and more ductile material rather than harder plate of a thinner gage that might give out more easily. The thinner a plate is made in the process of manufacture the harder it becomes. A plate 3/8-in. thick that will show 25 per cent elongation in 8 in., in a 1/4-in. thickness will show 20 per cent.

REVISION OF MARINE LAWS.

A letter was read from M. Zier, secretary and manager of the Zier Boiler & Sheet Iron Co., New Albany, Ind., expressing his wish to become a member of the association and willingness to contribute to its support, also stating that the former firm of M. Zier & Co. went into bankruptcy about five years ago on account of taking contracts in the state of Texas, and the writer stated that no doubt many other boiler manufacturers in the United States had lost thousands of dollars in the same manner. The writer suggested as important matter for discussion—First, the protection of manufacturers wishing to do business in the state of Texas; second, that boiler manufacturers should have protection on mill and warehouse material. In reply to the latter suggestion, Col. Meier stated that if Mr. Zier had been a member of the A. B. M. A. he would be aware of what had already been done in this direction, and called attention to resolutions passed at the Toronto meeting on the subject of selling to consumers. Secretary Farasey said that many boiler manufacturers outside of the association were entirely ignorant of what had been accomplished by it. One such manufacturer had lately complained to him that nothing had been done in regard to marine boiler inspection laws and in reply he had referred the gentleman to some thirty pages in last year's proceedings that show what the association had attempted to do in this direction, and while the greater amount of time, labor and money spent had not yet brought all of the results desired, yet the repeated agitation of the matter has undoubtedly accomplished much good. Colonel Meier, who was not present on the opening day of the convention, was asked to speak upon the subject of materials and also revision of marine laws. Referring to the latter, he said that the boiler inspection service being now a department of the bureau of commerce and labor, the proposed revision would have to come before congress with the approval of that department, and it is now so busy with matters having to do with corporations generally that it is a bad time to agitate the matter further, but he had been assured by Herbert Knox Smith, commissioner of corporations, that while it would be impracticable to secure a wholesale revision of boiler inspection laws at this time yet the department would cordially co-operate with the boiler manufacturers in any effort to amend or revise special sections of the law in order to meet modern commercial conditions; and Colonel Meier believes that the most practical way to secure what is desired in this direction will be in the manner indicated. At the time Secretary Shaw was at the head of the treasury department, the boiler inspection department being then under his supervision, the A. B. M. A. committee on uniform boiler specifications secured his hearty endorsement of needed reforms proposed by them, and had at that time every prospect of success except for the opposition of some very powerful interests which at that time the speaker did not understand the source of, but had since learned came from lake steamboat men who were opposed to a general revision, because they knew what they already had and were afraid that in getting something new they might get into worse trouble. At that time also the house committee was very favorable to the requests of the boiler manufacturers, and received them very kindly, asking very intelligent questions, but still when the matter got into the house it failed on account of the opposition above referred to. Still, the speaker thought that by continuing to thresh matters out with the supervising boiler inspectors a good deal could be accomplished to relieve the odium of the present laws, and particularly to secure recognition of the different seam values. At present the law recognizes only the double riveted lap, but one of the supervisory inspectors has worked up some elaborate tables which he intends to propose, and which this association will then be called on to criticize. That is the only way to get things done, to go after it vigorously, energetically and persistently, one thing at a time, and to complete the thing you begin, although it may be very hard work. A general repeal of the law is impossible, and it would certainly be a waste of time and money to try to get it at this time, for the reasons stated.

CONCERNING MATTER OF MATERIALS.

In regard to the matter of materials the speaker thought that the department had accomplished a great deal when you consider the condition of the trade some years ago. The A. B. M. A. specifications are used and approved, not only generally throughout this country, but requests are continually coming in from all over the civilized world. In regard to materials, the steel manufacturers object to certain stringent specifications and they went before the board of supervising inspectors without the knowledge of this association, and secured the adoption of their own specifications with some modifications. Later, a conference was had with them by a committee from the association in New York to endeavor to get together, and the only essential point of difference was the matter of sulphur. The speaker said that he was able to obtain the steel with less sulphur in it by paying a better price, which he was willing to do; but the

steel manufacturers said that they must have a little more latitude in regard to sulphur in supplying the general trade; however, the speaker thought there is no real antagonism between the two associations, and thought they could work together before the board of supervising inspectors. The speaker did not agree with Mr. Bateman, who is no longer in the steel business, in the idea that we are getting at present better steel than ever before. This is not a fact. It is more difficult to get good steel now than a few years ago, owing to the tremendous wave of prosperity and the great demand upon the steel mills to turn out product which does not always result in the best quality unless you stand up for your rights and demand it. If you will insist upon tests every time you can get it, although it may be difficult; but the man who does not look out for himself in that respect will get something inferior on account of the rush of business in the mills.

SUDDEN STOPPAGE OF MARINE ENGINES.

Discussion of topical questions submitted by Mr. J. Don Smith, second vice president, Charleston, S. C., was taken up on Thursday morning, the first question being, "Is the Sudden Stopping of High Pressure Marine Engines Detrimental to the Boiler?" As a contribution to the discussion of this question Mr. Smith requested the secretary to read a clipping from the September issue of the *American Marine Engineer*, in which was considered the question of whether too little water, or too much oil, was the cause of a collapsed furnace, and the writer stated that in his opinion the sudden stoppage of an engine, especially a high pressure one, has brought more crowns down than low water, or excessive use of cylinder oil. He was selected as one of two engineers to stand watch in the boiler room of a Pennsylvania railroad ferry boat for the New York Twenty-third street ferry while the boat was being conveyed to New York from a Philadelphia ship yard. While in charge of some of the fitting up of the boilers he had placed gaskets on all manhole plates and had objected to using the common low pressure gaskets, kept in stock by the firm, but the foreman overruled his objections, and they were used. There were four Thornycroft boilers of large type, carrying 180 lbs. on the boiler, and cut down to 150 lbs. at the engine by a reducing valve. Each boiler had three cylindrical-shaped legs, having a manhole in each leg, in the fireroom end of the boiler. On the trip the nuts on the dogs on the plate were repeatedly screwed up, the pressure being too great for the type of gasket used to stand, until the rubber was actually forced out, and practically the bare canvas was all that remained. The plates were kept from leaking on the whole trip, but no one above gave any information of our being close to the dock in Hoboken, and when a sudden stop was made, the instant the steam was shut off of the engines the water and steam gushed out of the leg and manhole plates of all four boilers; and the writer frankly confesses that never in his whole career as an engineer had his heart and his stomach been so close together. His partner and himself both being in the fire-room at the time, gingerly tackled all 12 plates and screwed them up, stopping the leaks. This experience proved that a sudden stoppage of the flow of steam with heavy fires in operation and safety valves unable to cope with the surplus steam will cause such a sudden shock that the crowns must suffer. Several years ago one of the ships of the company the writer is now serving with came into port with one of her crowns buckled, not badly, but plainly enough to be seen by anyone. The ship had two boilers and two furnaces in each boiler, and only one furnace had buckled. When a crown comes down, the first charge against the engineer is too much oil; and so the boiler maker and the assistant engineer stood by to see that the crown was not touched, after boiler was blown out and opened up, until headquarters had seen for itself the condition of the boiler. Everything was found in first class shape; not a trace of oil could be found, nor was there any known weakness of the furnace tubes.

In the investigation that followed it was found that the captain made a practice of stopping (without any warning to the engineers) the ship at sea to heave the deep sea lead.

Less than two minutes after a sounding the furnace came down, and the shock and nothing but the sudden shock of stopping, brought it down, in his opinion. The chief was exonerated and the captain was warned against a repetition of such practice.

DIFFERENCE OF OPINION.

Mr. Burke thought that the sudden stopping of a high pressure marine or other engine, if the same was properly constructed and working at normal pressure, should not be detrimental to the boiler, and gave as a reason that he had seen a cotton press at Savannah, Ga., in operation, and as the bales compressed were introduced and again withdrawn and the pressure relieved, the needle would fluctuate 10 or 15 lbs., and there was no bad results during the three or four years he has seen it in operation.

Captain Rees stated that he had built the boilers for the compresses in question, the batteries previously in use having exploded on account of this excessive variation of pressure, and because the heads had not been properly stayed. The fall was somewhere about 20 or 25 lbs. in pressure at every revolution of the cylinder.

Mr. Kehoe thought that such sudden stopping and starting would injure a boiler, and that the boiler should be built especially to withstand the extra pressure. Mr. Finnigan said that he had stood on the side of a compress boiler and seen the boiler breathe or pulsate with the variation in pressure at the Atlantic Compress Co. They were carrying from 120 lbs. to 150 lbs. He thought it detrimental to the boiler.

Mr. Cole agreed with the last speaker.

Colonel Meier thought that for such use it was about the severest test that could be put on a boiler.

Mr. Rees said that he put drums on, and instead of leaving a solitary opening he put on a double drum with the openings quite large so that there would not be a sudden draw in one part of the boiler. He thought that unless the boiler was built especially to stand such strain it would in time fracture the boiler.

Mr. Ryan, of Duluth, thought that with a boiler built for a certain pressure the sudden opening of the throttle valve ought not to make any difference. A boiler built according to standard specifications for 150 lbs. pressure ought to stand at least 1,000 lbs. bursting pressure, and he could not understand why such a boiler properly built would vibrate as represented. He had seen pulsation in a battery of boilers running a big Corliss engine of say ½-in. to ¾-in., with steam drums on them; but he had no faith in steam drums, and thought a good dry-pipe with a large opening was as good as a steam drum. He considered the latter nothing but a condenser, and if a condenser is wanted, let it be put on the engine.

Colonel Meier thought that the wear and tear on a boiler of a cotton press is much more severe than in a case of a marine or any other engine. He asked what is the difference between cutting off at every

stroke and cutting off once for all with the throttle valve, the boiler has to stand it. It can hardly be said to be detrimental to the boiler, because you cut off just as suddenly with the regular cut-off mechanism as with the throttle.

Mr. Ryan stated that with a boiler properly braced it will move from ⅛-in. to 3/16-in. in a 72-in. boiler, and this, so far as he knew, would not be detrimental with a regular standard high pressure or slide engine, if the boiler was properly constructed, and only carrying its rated capacity of steam. If built for 100 lbs. pressure, and carrying 150 lbs., that would be a different proposition.

Mr. Brunner thought it depended upon how fast the boiler will evaporate water and make steam. The safety valve ought to take care of the increased pressure, and he did not think it would be detrimental.

Mr. Ryan thought that the greatest detriment to marine boilers in lake practice is the fact that the engineers do not have sufficient time to take care of the boilers when they are in port. They come into the ore docks, blow off, pour cold water in the boilers, and in five or six hours are going out with steam up. He thought, however, that the safety valve ought to take care of the trouble referred to in the question.

EXPLOSION OF MARINE BOILERS.

Mr. Hartley mentioned the fact that the majority of violent explosions that have taken place in marine boilers have been at the starting of the boilers, not the stopping. A marine engine takes steam with a gulp that relieves the pressure that has been standing on the boiler. Probably the boiler plates have become overheated, decomposition of steam takes place, and as soon as the pressure is relieved and the globules have been relieved, the overheated plates cause a volume of steam to rise up more than the safety valve can take care of, and consequently if the boiler is weak an explosion takes place. The same thing applies to locomotive boilers. Locomotives are liable to be suddenly stopped, and the safety valves must take care of the pressure. Mr. Hartley could not understand the great pulsation of the boilers mentioned. If they were cylinder boilers, perfectly round, how could they pulsate, as the pressure is equal on all sides?

Concluding his remarks, Mr. Hartley paid his respects to the steam dome on boilers, which he condemned strongly, in which others present agreed with him.

The next question was: "Is the Ordinary Boiler Inspector of the Insurance Companies and the Government a Hindrance or an Aid to the Boiler Manufacturers?"

In reply, Colonel Meier said that the question could not be answered categorically, it depends upon the man. If well posted and honest, he is a help; otherwise, a decided hindrance. In this there was general agreement, Mr. Bate stating that in his section of the country general reliance was paid to the inspector's advice in the matter of specifications, etc., and he did not know how they would get along without the inspector.

Question 3: "Can any of the members give from experience of practical testing, best spacing of tubes in high pressure boilers?"

In answer to the above, Mr. Richard H. Bate, of Wm. T. Bate & Son, Conshohocken, Pa., read the report of a special committee on this subject which was made to the A. B. M. A. in 1889, and appeared in their printed proceedings of that year, and is as true now as it was then, viz.:

QUESTION OF TUBE SPACING.

The question of the tube spacing is largely dependent on the quality of water to be used, and also on the circulation of the water in the boiler. The generally received opinion of water circulation is, that there are two currents at work in the boiler. Both have their rise at the bottom, just over the fire. One is a fore and aft circulation; the other an up and down current. The fore and aft current rises among the tubes carrying the water from the lower front to upper back end. There it falls and sweeps the bottom to the front again. The up and down current rises among the side tubes and falls among the center tubes, the center being colder than the sides. The spacing must be arranged to give as free play to these currents as possible, so that when steam is formed on a plate, it may be immediately swept off and taken to the steam space. It appears to be necessary to have a large space at the bottom of the boiler so that a sufficient body of water may be maintained there to prevent burning. There should be a good space between the shell and tubes, and a center space should be allowed between the tubes for a downward current.

The distance of the tubes from each other should be dependent on the quality of water used, but must be enough to allow a free circulation. Our practice is to allow a space between shell and tubes of one-eighteenth of the diameter of the boiler. This gives 3 in. of space in a 54-in. boiler, and 4 in. in a 72-in. boiler.

The center space should be one-fifth of the diameter of the boiler giving 5 in. in a 60-in. and 6 in. in a 72-in. boiler. This rule is independent of the size of the tubes.

Each tube should be one-third of a diameter from every adjoining tube, both horizontally and vertically, but no tube of any size should be nearer than 1 in. to any other.

One good reason for this minimum is that less distance will not give sufficient strength to the metal between holes to resist the stretch of the expander, in resetting tubes.

There should generally be a manhole below the tubes, especially so with bad water, to facilitate cleaning; also to make sure that there is a sufficient body of water below the tubes.

In small boilers, use a small manhole or a very large handhole. The tubes should be placed higher than threefifths of the diameter from the bottom of shell, except where a dome is used, when they may be carried one row higher. One method of arriving at the proper number of tubes in a head is to make their inside area a certain percentage of the area of the head. Sixteen to 18 per cent of the area of the head seems to give good results. The ends of tubes should be beaded to aid the tubes in staying the heads.

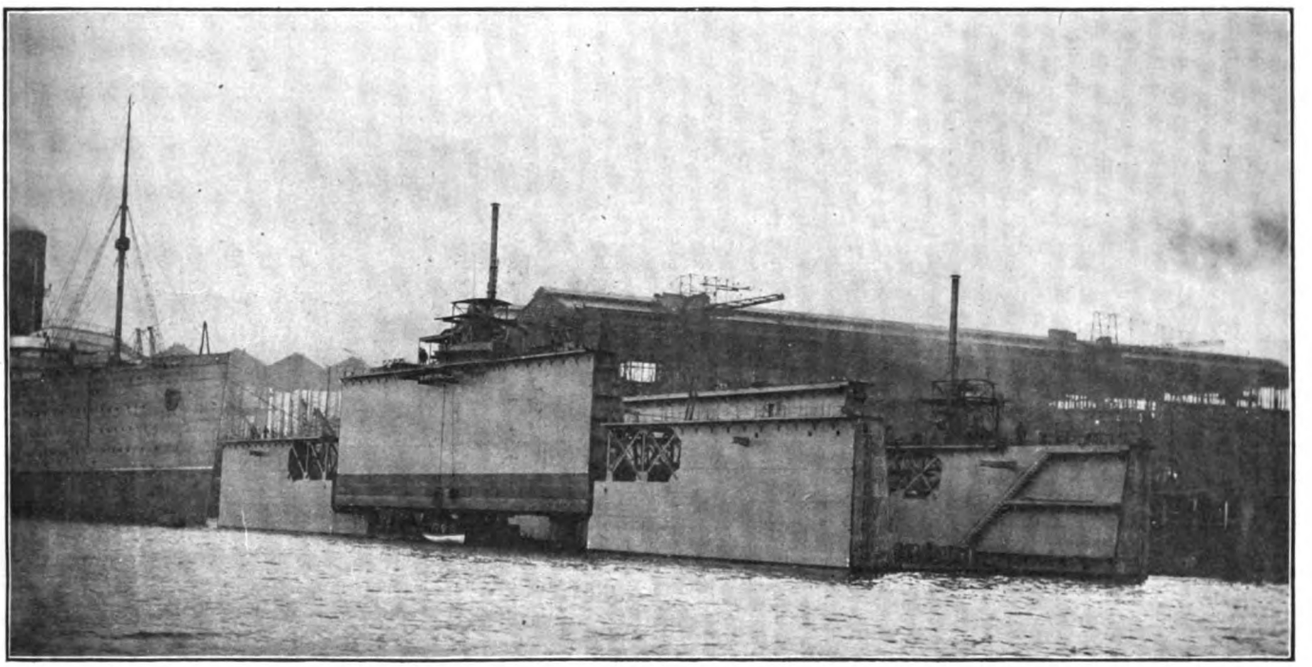
TESTING OF BOILERS WITH COLD WATER.

The fourth question was: "Is the testing of boilers with cold water injurious to same?"

Colonel Meier in reply said that that depends upon several circumstances. If you were testing a boiler at Duluth, where the temperature was 40 below zero, I would advise warming the water a little; and if testing in Georgia in the summer time, at 104 in the shade, you would not need to warm the water. Anything can be made very injurious if carried to extremes. We recommend in the standard specifications that were adopted by this association that the hydrostatic test shall never, on boilers built strictly to the specifications, exceed working pressure by more than one-third of itself and this excess limited to 100 lbs. per square inch. The water used for testing to have a temperature of at least 125° F. The speaker was asked whether as a practical boiler builder building for his own use he would test with cold water, and replied that he believed he would.

Mr. Brunner thought he would, but not above pressure to be carried.

Before the adjournment of the convention President-elect Cole acknowledged the compliment paid him in re-electing him to another term, and congratulated the members on the fact that there was evidently more ginger being displayed and every prospect of a healthy growth of new



SELF-DOCKING OPERATION, SHOWING THE CENTRAL PORTION LIFTED BY THE TWO END SECTIONS AND RESTING ON THEIR POINTED ENDS TURNED INWARDS. TO THE LEFT IS SEEN THE BOW OF THE MAURETANIA AND BEHIND HER THE GREAT SHED UNDER WHICH SHE WAS CONSTRUCTED BY SWAN, HUNTER & WIGHAM RICHARDSON, LTD.

timber during the coming year. There was a general feeling that the convention to be held next year at Atlantic City would bring out the largest attendance for many years, and meantime vigorous campaign work is to be done.

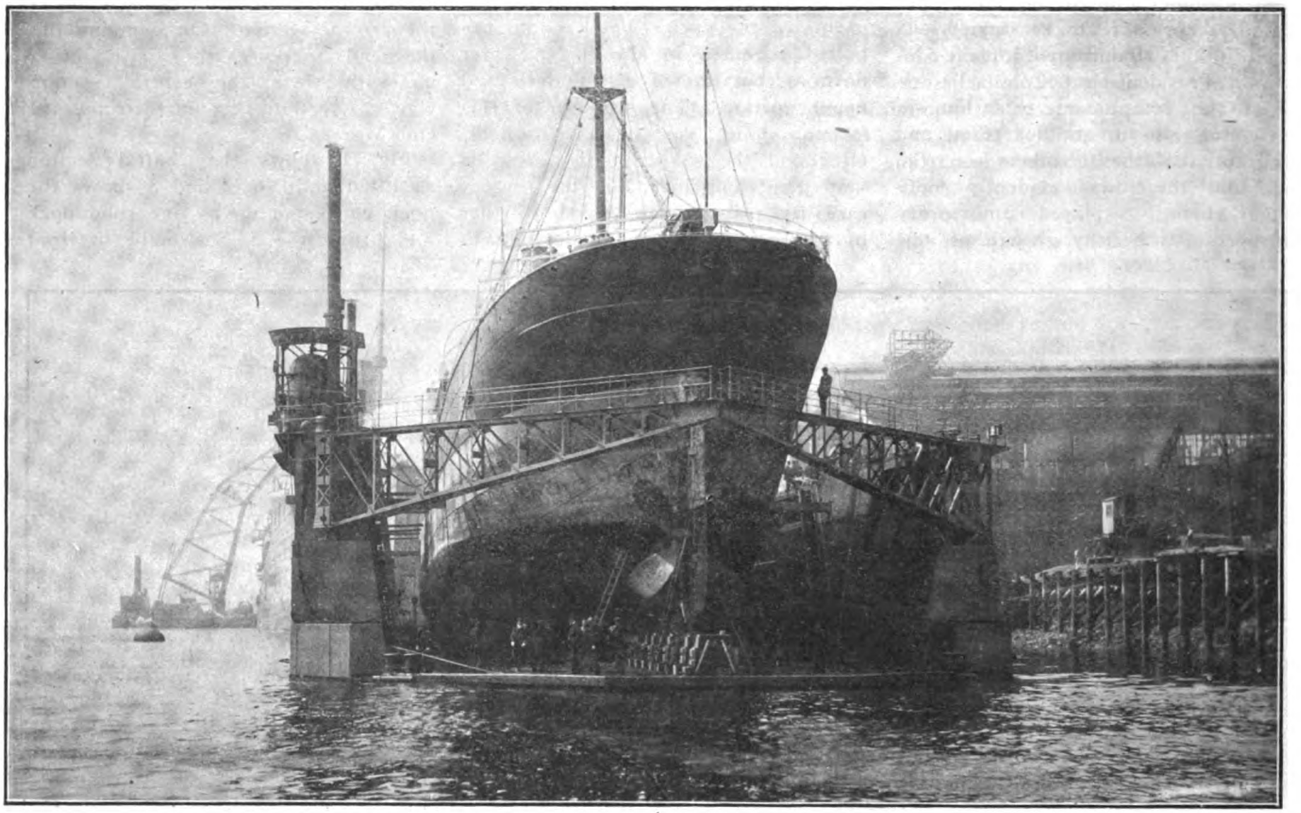
THE FLOATING DOCK FOR TRINIDAD.

The floating dock which has been constructed by Messrs. Swan Hunter and Wigham Richardson, Ltd., of Wallsend-on-Tyne for the Trinidad Dock & Engineering Co., Ltd., has been safely delivered to the owners at Chaguaramas Bay, close to Port of Spain, where she will be located. The dock itself is interesting in that it is the first completed example in Britain of a somewhat new type of self-docking floating dock which has been designed by Messrs. Clark and Standfield, expressly to provide great longitudinal stiffness. It consists of three sections of approximately equal length, which are rigidly connected together into a whole by means of joints running round the complete profile of the dock. The sections are bolted together in the under water portions, but riveted in the walls and upper portion. The strength of this forming joint, running, as it does, all round the shape of the dock, is very great and, indeed in the present case its resistance is equal to that of the net section of the dock itself, so that, when connected up the latter may be considered as a "solid" or box dock. The length of the dock is 340 ft. over the pontoons or lifting portion, but steel working platforms are provided at each end, bringing the over all length of the floor up to 365 ft. The clear width of the entrance is 62 ft. The lifting power of the dock is 4,000 tons in fresh water, and it has been designed to take vessels drawing normally 16 ft. of water, over keel blocks 4 ft. high, but a sufficient freeboard has been given to the walls to enable the dock to be sunk to a further depth of a couple of feet if a vessel of abnormally deep draught be met with.

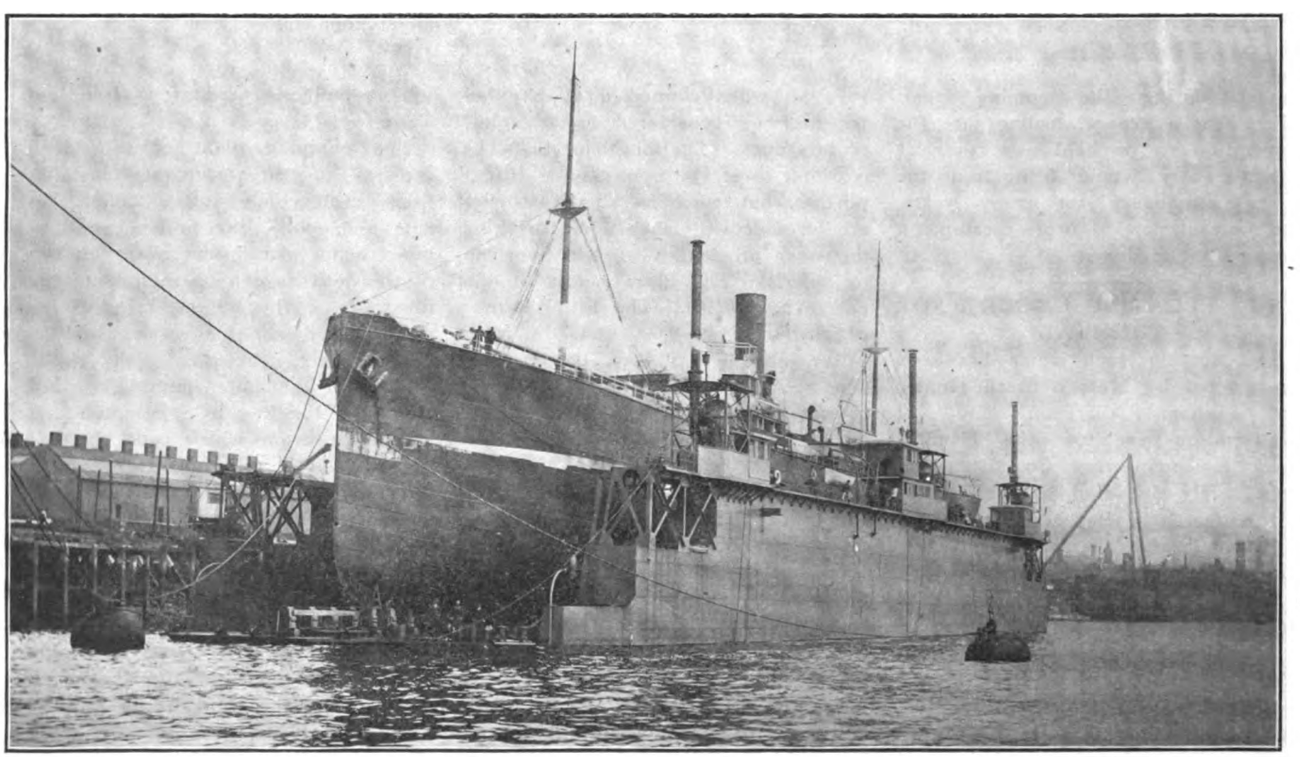
Our illustrations which are from photographs supplied by the builders show the actual self-docking operations of this type of dock. For this purpose the three sections of the dock are disconnected and the two end sections are turned round end for end, so that their points come opposite to the central section which is square-ended. They are then lowered under water and drawn in under the central section. On pumping out the end sections, they rise, bring up with them the central section which is then resting on their pointed ends.

Fig. 1 shows the central section so lifted and No. 2 and 3 shows the dock connected up as one solid dock and lifting the S. S. Nembe in front of the builder's yard at Walsend-on-Tyne.

The pumping plant of this dock consists of three separate installations, each comprising a boiler, engine and pump, the boilers and engines being placed on houses on top of the deck as can be seen from the illustrations, the pumps being, however, placed right down as low as possible at the bottom of the walls. The three separate pumps are all connected together by a common cast iron main drain which runs the full length of the wall and from which the different compartment pipes branch off. It is therefore possible to utilize either all of the three engines and pumps in lifting a ship, or two, or only one if the dock is being brought up light, and of course in the same way, if any one, or, indeed two of the installations were to break down, the third would still be capable of lifting the dock by itself. The pumping installation according to contract should be capable of lifting a vessel displacing 4,000 tons in 2½



STERN VIEW OF THE NEMBO IN THE TRINIDAD FLOATING DRY DOCK. TO THE LEFT IS SEEN SWAN, HUNTER & WIGHAM RICHARDSON'S MAMMOTH FLOATING CRANE TITAN (140 TONS LIFT) ALONGSIDE THE MAURETANIA.



SIDE VIEW OF THE DOCK AFTER LIFTING THE STEAMSH IP NEMBO (ELDER, DEMPSTER & CO.) IN 70 MINUTES.

hours. In the case of the dry docking of the steamer Nembe, this vessel which displaced at the time 3,000 tons was lifted in 70 minutes so that it is evident that the pumping plant is more than capable of doing its contract work.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Fig. 17 shows the deck house and cabin arrangements.

Sitting room, captain's office and dining room side walls paneled quartered oak; broken panels.

Ceilings canvas and pine painted.

Stateroom, bathroom and captain's bedroom in texas, side walls paneled quartered oak, full panels above and below chair rail.

Ceilings canvas and pine painted.

Owner's stateroom and bathroom in forecastle; side walls paneled, pine full panels.

Ceilings canvas and pine painted.

Balance of cabins; side walls ceiled with narrow "V" jointed oak ceiling.

Ceilings pine painted white, except pilot house, which is light green.

Stewards and engineers' shower bath lined with galvanized iron.

Floors are of pine in sections in the following rooms, captain's office and bedroom, owner's sitting room, stateroom and steward's room.

Asbestolith floor in the following rooms: Captain and owner's bathroom, engineer and steward's bathroom, hallway, dining room, store room, pantry, galley and crews' mess.

Linoleum cemented on in the following rooms: First mates, second mates, watchmen, wheelsmen, oilers, assistant engineers, chief engineer and porters. All sash of cherry. All outside doors of pine, grained on inside to suit finish of room.

Galvanized iron pockets for all windows except pilot house, pockets to be watertight.

Galley sink to have open plumbing; splash and dripboards to be bedded in lead to make a tight and sanitary job.

All the joiner work is prepared in the shop, ready for putting in place, with the exception of sheathing and furring.

Fig. 18 shows the outboard plan above the 18-ft. water line and the spar deck as the vessel appears when completed ready for sea.

The hatch coamings are of the channel type 12 in. deep and the covers are of steel. The coamings, covers and fittings for the hatches are all laid off in the mold loft, and completed, so that no drilling is necessary in putting the hatches together on the ship.

The deck scuttles are of the bulb angle style and are also completed in the shop and erected in place on the deck ready for riveting to same.

The bulwarks and railings are all fitted from the ship, which are composed of 10-lb. plate properly stiffened around the stern to forward end of boiler house, from stem to within about 10 ft. of break of forecastle deck and from forecastle to No. 1 hatch.

A monkey rail is fitted on top of bulwarks forward, extending about 8 ft. aft of stem. On top of bulwarks forward and aft two half-round bead irons to be fitted and a slotted pipe on top of monkey rail.

Bulwarks around top of pilot house of steel with a slotted pipe on top.

The railing amidships on spar deck is removable and consists of bar iron stanchions, fitted into wrought iron sockets.

Two galvanized wire ropes, about ½ in. in diameter, rove through holes in stanchions and set up with turn-

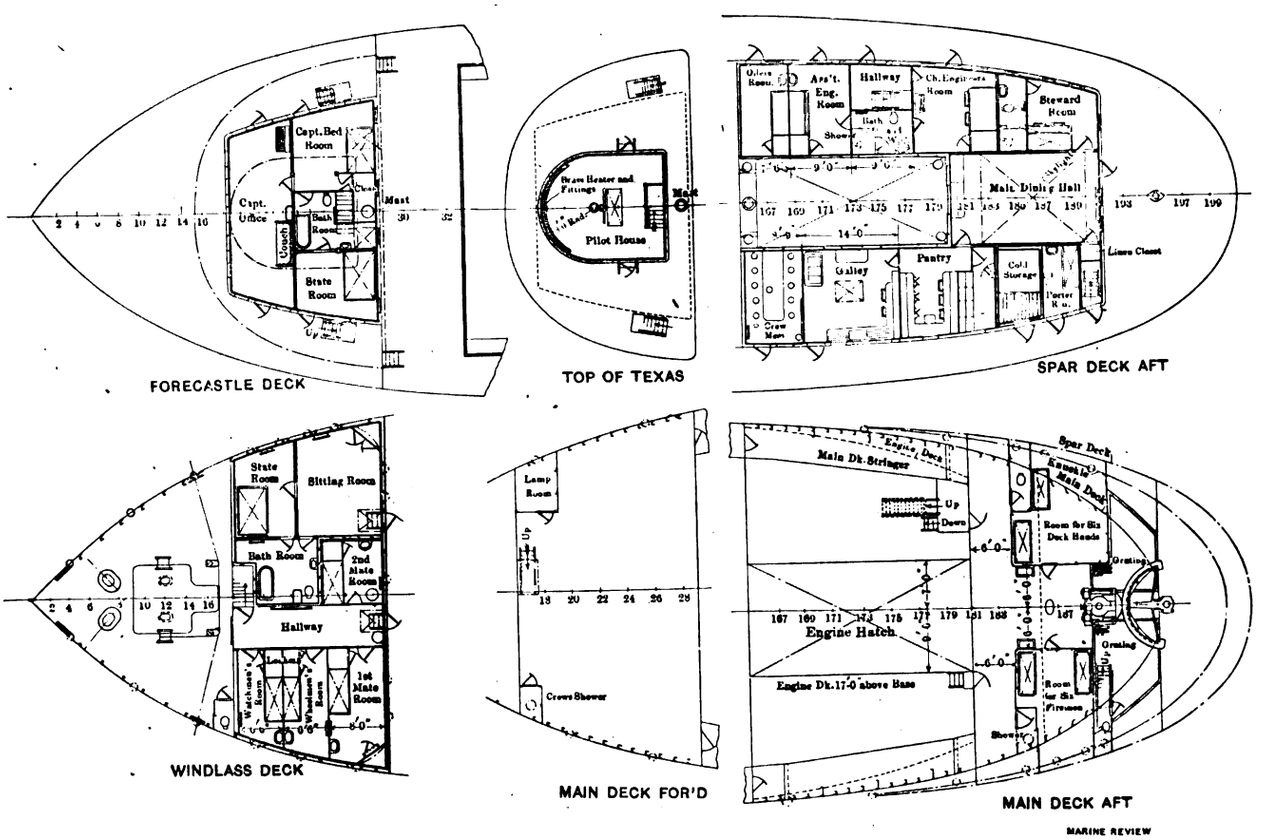


FIG. 17.

buckles, same to be parted in the middle and connected with hooks and thimbles.

Hawse pipes, timber heads, chocks and scuppers are of cast iron and all laid out from the mold loft floor and placed in position on the ship without any drilling when fitted.

The hawse pipes are of a suitable size for stowing anchors and the flanges are strongly fastened to the shell of the ship.

The two masts are built entirely of steel properly stepped and supported, with all necessary iron work and galvanizing iron wire rigging set up with turnbuckles, two shrouds each side with iron ratlines.

The masts and rigging, as shown on these plans, are all laid out and completed from the mold loft floor so that when the masts are erected the rigging is also put on and completed ready for sea.

Winding engines are of 8-in. by 8-in., single drum, steam deck winches, furnished with reverse valves, and are located as shown on plan, connected up ready for use, with a separate branch from main steam pipe for each engine. Engines are bolted to 6-in. channel beds properly riveted to deck plating.

Four davits 4¼ in. diameter, hinged and furnished with all necessary steps, cleats, etc., for two boats, also one davit at stern of ship for handling wheel buckets, one davit at each side of after house for handling stewards' supplies, and one portable davit arranged to go at end of No. 1 hatch and at each side of ship at break of forecastle.

Iron stairways and ladders with round corners, cast iron treads are provided from forecastle to spar deck, from spar deck to main deck forward and aft, from spar deck to engine room and from 'tween decks aft to engine room, one on each side, also from working platform to lower engine room.

Pilot house platforms of steel and iron, steps provided from same to forecastle deck and top of texas.

Ladders provided in boiler room where necessary, also from spar deck to cargo hold, one ladder forward and one aft, and from main deck to fore and after peaks. Pipe ladders provided one on each side of boiler house and one at after end of after house.

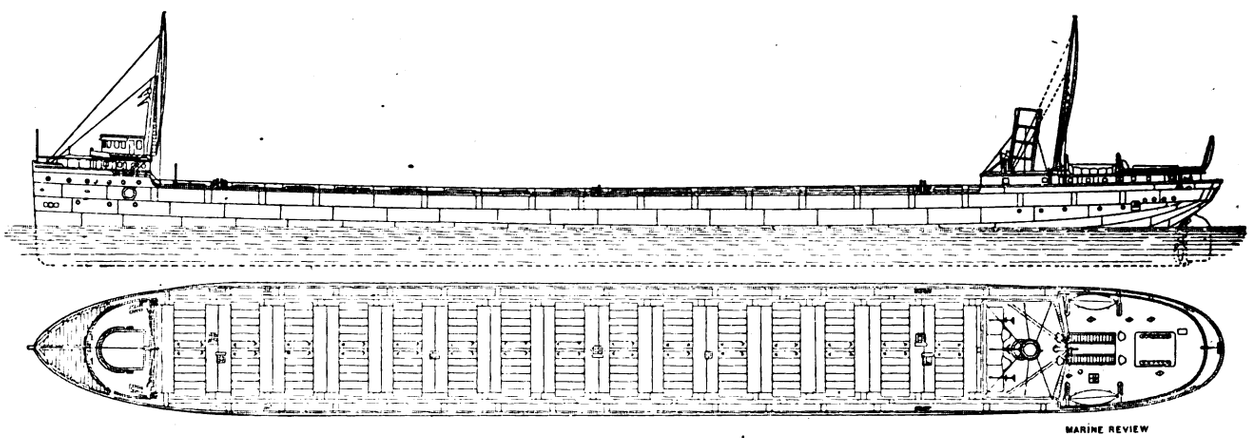


FIG. 18.

Staple ladders are fitted at hold bulkheads, one on each side, from tank top to main deck stringer, also one ladder in each compartment from manhole in main deck stringer to bilges.

All this work is laid off and completed in the shop ready for placing on the vessel.

INSTITUTE OF MARINE ENGINEERS.

At Olympia on Saturday, Sept. 28, on the occasion of an official visit to the Engineering exhibition by the Institute of Marine Engineers, two interesting papers were read. One was on "New Methods of Effecting Boiler Repairs," by Harry Ruck-Keene, and the other on "Sanitation and Ventilation," by A. E. Battle. The new methods described by Mr. Ruck-Keene were the oxy-acetylene and electric processes of welding. For the purpose of repairing boilers by the former process the necessary apparatus consists of a steel cylinder containing oxygen gas and another containing dissolved acetylene, both under pressure, a special blow-pipe, flexible tubes for transmitting the gases from the cylinders to the blow-pipe, and small bars or rods of iron or mild steel about 3-16 of an inch in diameter, which are fused and attach themselves to the parts to be united. The oxygen and acetylene gases in these cylinders are led to the blow-pipe by means of the before-mentioned tubes and there ignited at the nozzle, the resultant flame giving out an intense heat. Where plates are wasted away by corrosion or otherwise, the wasted parts are first thoroughly cleansed to remove any dirt or grease and are then heated to a welding heat by means of the flame from the blow-pipe. The iron or steel bar is in the meantime held in this flame until a small portion at the end of the bar is melted off and attached to the part to be repaired, and this process is continued until by the addition of drop after drop sufficient metal has been added to bring the plate up to its required thickness. After the welding operation the surrounding plate is heated by means of the blow-pipe to counteract, as far as possible, the strains that might be set up by the intense local heat. In the electric process the cable from one pole of a dynamo is connected to some part of the boiler and the cable from the other pole is connected to the welding bar. This welding bar is fixed in an insulated holder and on being brought into contact with the article to be dealt with and then withdrawn a short distance, an electric arc is formed, which rapidly heats the parts in close proximity to the arc, and at the same time the end of the bar is heated to nearly a molten condition and pressed on in almost the same way as sealing wax is made to adhere to paper. Lantern views were shown of repairs carried out by these processes and samples were handed round showing the character of the work. In a short discussion which followed, J. T. Milton, of *Lloyds*

Register, spoke approvingly of the system where the work was not of extraordinary size. In reply to questions, Mr. Ruck-Keene stated that the cost was practically the same as in hand labor but a great saving in time was effected. If the work were done by trained men there was nothing to prevent it being passed by Lloyds. He was not prepared to say which process he preferred. They were both good.

Mr. Battle in his lecture impressed the necessity of reform in the berthing and hygienic arrangements on board ship. Under general present conditions to keep a watch for four hours in a close and heated atmosphere, after sleeping in a badly ventilated and badly situated berth, required considerable effort on the part of the officer to keep from napping on his watch. In the matter of air space, the authorities allowed Tommy Atkins when in barracks 600 cu. ft., and in common lodging houses the allowance was 300 ft. per man. In the light of these figures the basis of 72 cu. ft, as allowed by the Merchant Shipping Act, was surprising. Dealing with the question of bunks, the lecturer suggested the following rules: All bunks should be constructed clear of the ship's side or bulkhead, to allow a free circulation of air. They should be placed against the inner bulkhead—not against the ship's side. They should all be removable, the framework be of iron and wire springs substituted for the usual wood lathing. The sides or bunk boards should be not more than 8 in. deep, and the foot and head boards should be carried within 6 in. from the deck above. He advocated for the ventilation of the bunkers an air current passing through the coal.

HORIZONTAL CURTIS TURBINE GENERATING SETS FOR MARINE SERVICE

Until the attention of the public was called to marine turbine development by the recently built turbine-driven liners, this source of power for marine use had hardly received its due amount of consideration. The construction of these liners calls attention to other turbine installations on shipboard and directs the public gaze to the progress made in this line.

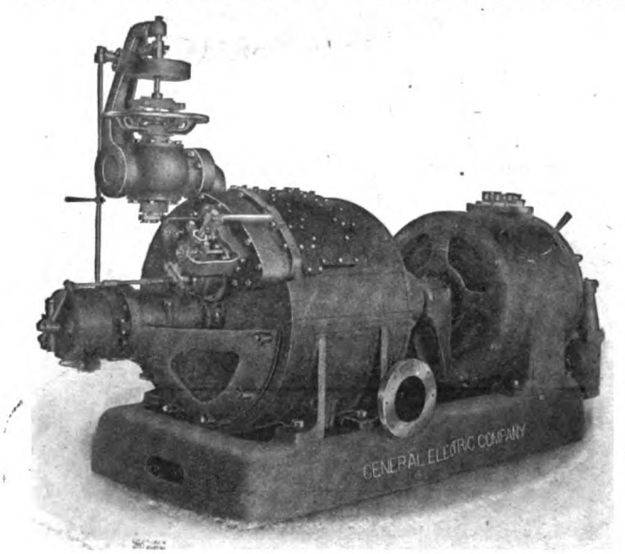


FIG. 1.—CURTIS STEAM TURBINE GENERATOR SET C4-75-2,400-FORM T, 125 VOLTS.

The rapid development of electric drive and the immense widening in the scope of electrical applications in marine service, require such an increasing amount of electrical power that engine driven units of suitable size for general use aboard ship are coming to occupy altogether too much space. It is to meet these changing conditions that the steam engine is being displaced by the Curtis horizontal turbine, especially in lake service, where it is particularly valuable both on account of its low head room and the high efficiency obtainable from condensing operation.

In Fig. 1 which shows a complete 75-kilowatt set, the turbine is shown at the left, the generator being at the further end of the base. This cut also shows the throttle and governor.

Nowhere has the expansive force of steam been utilized to greater advantage than in the steam turbine, where instead of the cycles of intake, expansion, exhaust and compression, as they appeared in the old reciprocating engine, there is simply a constant flow of steam. The directed kinetic energy of the steam is consumed in rapidly rotating a large disc.

The great number of small radial buckets set in the periphery of this disc presents an enormous area to the entering steam. This steam strikes the buckets after passing through stationary inclined nozzles set in a plane tangent to the disc. The nozzles (Fig. 3) are inclined in the direction of rotation of the disc and at about 20 degrees to the plane of it so that instead of entering from the end of the buckets as the stream in a Pelton water wheel the flow enters at the sides.

On leaving the stationary nozzles, the steam passes through a small clearance space and impinges on the concave surface of the buckets imparting a rotary motion to the disc. These buckets may be seen in the edge of the discs in Fig. 2 which shows a 75-kilowatt turbine with the upper half of the casing removed. After leaving the movable buckets the direction of the steam flow is so turned that although still acting in a plane tangent to the disc its direction is practically reversed.

As the steam is still under considerable compression, it is quite desirable to make use of its remaining energy by the use of another set of revolving buckets or even by several more. The direction of flow being reversed by each set of movable buckets, it must be redirected each time in order to be used on the next set. This is done by placing between each two sets of movable blades, a stationary set whose concave faces are turned in the opposite direction. Each set of movable blades then makes with its set of stationary blades a series of SSS; each one divided at the middle so that the top halves may move to the left while the bottom halves remain stationary. Steam from the nozzle striking on the concave sides of the upper halves tends to push them to the left. The direction of flow is

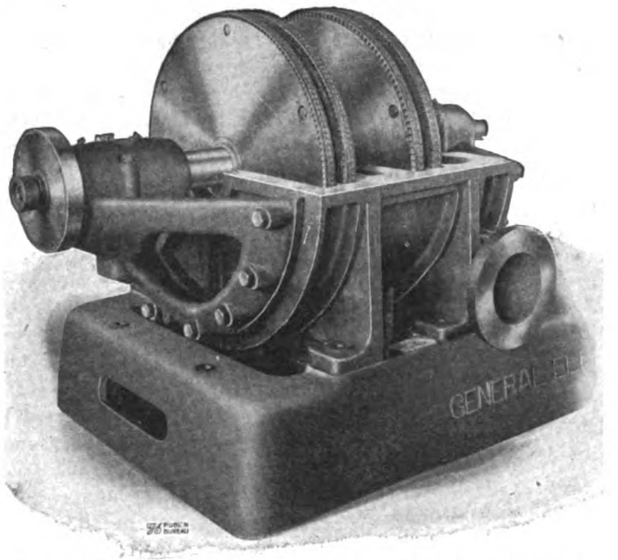


FIG. 2.—75 K. W. TURBINE WHEELS ASSEMBLED IN WHEEL CASING, UPPER HALF REMOVED.

now reversed and the steam striking the concave side of the stationary blades is again reversed, so that it flows in the same direction as at first. It then strikes the second set of

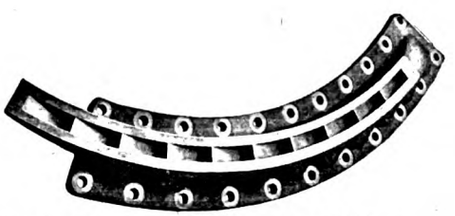


FIG. 3.—FIRST STAGE NOZZLE FOR 2,000 K. W. CURTIS STEAM TURBINE.

movable blades which is similar to the first set.

The appearance of the rotating bucket sections as well as the manner of attaching them to the disc is quite plainly shown in Fig. IV. Fig. V

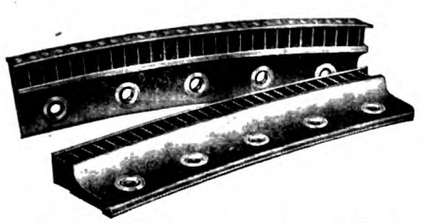


FIG. 4.—REVOLVING BUCKETS FOR 2,000 K. W. CURTIS STEAM TURBINE.

shows the slightly different construction of the stationary buckets.

While the clearance between blades is so small as to be almost negligable there is absolutely no contact between stationary and rotating parts except at the shaft bearings.

Simplicity was particularly sought after in the construction of the Curtis turbine generators so that it requires a minimum of attendance. Oil is supplied to the bearings under slight pressure but none enters into the turbine case, thus insuring a perfect freedom of oil in the exhaust steam, allowing it to be used in a heating system or returned direct to the boilers after condensation.

Horizontal Curtis turbine driven units are now made in sizes from 15 to 300 K. W. capacity. In the sizes up to 25 K. W. both generator and turbine are put on the same shaft, which runs in two bearings. Sizes over 25 K. W. are assembled on a two-part flexibly coupled shaft running in four bearings.

One of these units is in use on the Hudson River Day Line boat Hendrick Hudson, which, built a little more than a year ago, represents the latest and best type of river passenger steamers. This generating set furnishes power for lighting, electric fans, dish washers and other electric apparatus in use on this boat.

The turbine speed is governed by changing of the number of nozzles through which the steam enters. This speed regulation is carried out by a centrifugal governor, which, mounted on the end of the turbine shaft so varies the steam intake as to give constant speed at all loads. This is quite necessary in lighting service as a very small variation in speed would cause quite a disagreeable flickering

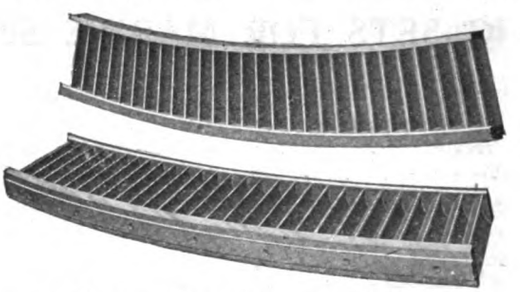


FIG. 5.—STATIONARY VANES FOR 2,000 K. W. CURTIS STEAM TURBINE.

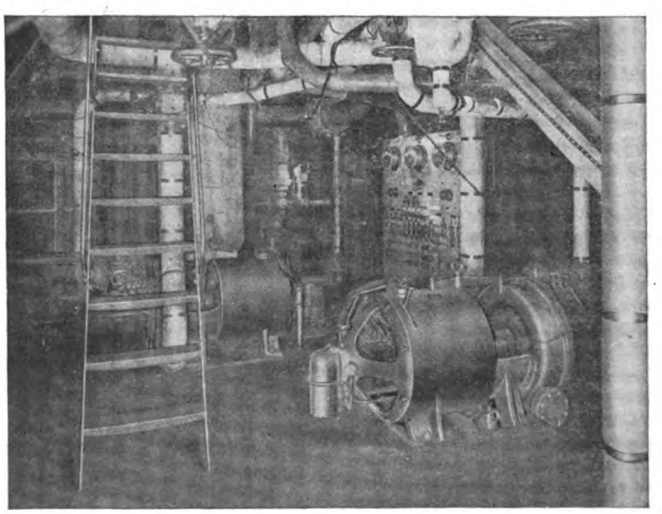


FIG. 6.—C2-25 K. W. 3,600-125 VOLT HORIZONTAL CURTIS STEAM TURBINE SETS IN ENGINE ROOM OF HUDSON RIVER DAY LINE BOAT HENDRICK HUDSON.

in the lamps. The turbine indeed, gives much better regulation and steadier lights than the old reciprocating engine. Owing to the small weight the turbine sets are easily installed, and as they are entirely free from reciprocating parts, require a foundation of but very moderate size and weight.

The smaller sizes may be operated at any pressure above 80 pounds and the larger at any pressure above 100.

The three great advantages—compactness, simplicity and a high maintained efficiency, are today responsible for the extensive use of Curtis turbine driven generating sets where formerly engine driven sets were commonly used.

KEYLESS ARCH FOR WATER-TUBE BOILERS.

The fire brick arches of water-tube boilers are a frequent source of trouble and expense, owing to their encountering the intense heat of the flames in the furnace and rapid burning away. Being curved they require a centering upon which to rebuild them. Messrs. Poulton & Son, Reading, England, have devised a form of keyless arch shown in our illustrations. These arches are manufactured from a special mixture capable of withstanding the great heat generated in forced draft water-tube boilers better than the ordinary fire brick. As will be seen the arch is built up in segments with overlapping flanges, so that should any of the sections be burnt out, necessitating their removal, the replacement can be easily and quickly carried out without interfering with the other portion of the arch. The system of building up is equally applicable to camber and flat arches, and a further development of the curvilinear system of boiler setting has been made in the construction of flue covers. Fig. 2 shows the improved construction whereby the heat usually lost by radiation through the flue cover is prevented by providing cavities on the upper surface to enclose a layer of air between the cover and the brick work or flagging.

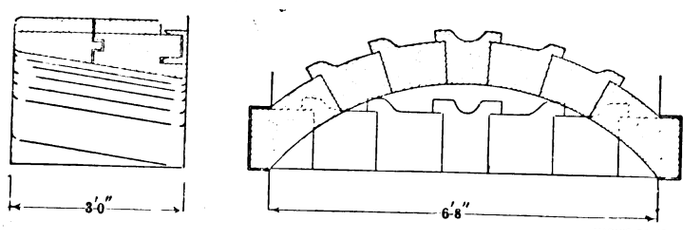


FIG. 1.—POULTON'S PATENT KEYLESS ARCH.

JAPANESE SHIP BUILDING.

The fact that Japan is not much behind other maritime nations in her ship building capabilities has been already proved in the construction of the two mammoth battleships Satsuma and Aki; it is once more confirmed by the launch of the Tenyo Maru at the Mitsubishi Dock Yard & Engine Works, Nagasaki. She is a triple-screw turbine steamer, of 13,500 tons gross, and is the first of three sister ships built to the order of the Toyokisen Kaisha (Oriental Steamship Co.) for their Trans-Pacific service between San Francisco, Japan, and China. She is not only the largest merchant steamer ever launched in the Pacific and Indian oceans, but also the largest turbine driven passenger steamer built outside Great Britain. Her principal dimensions are as follows:

Length between perpendiculars	550 ft.
Breadth, molded	63 ft.
Depth, molded, to upper deck	38 ft. 6 in.
Height between upper and shelter decks	8 ft.
Height between promenade and shelter decks	9 ft.
Height between boat and promenade decks	9 ft.
Maximum draught	31 ft. 8 in.
Displacement	21,650 tons

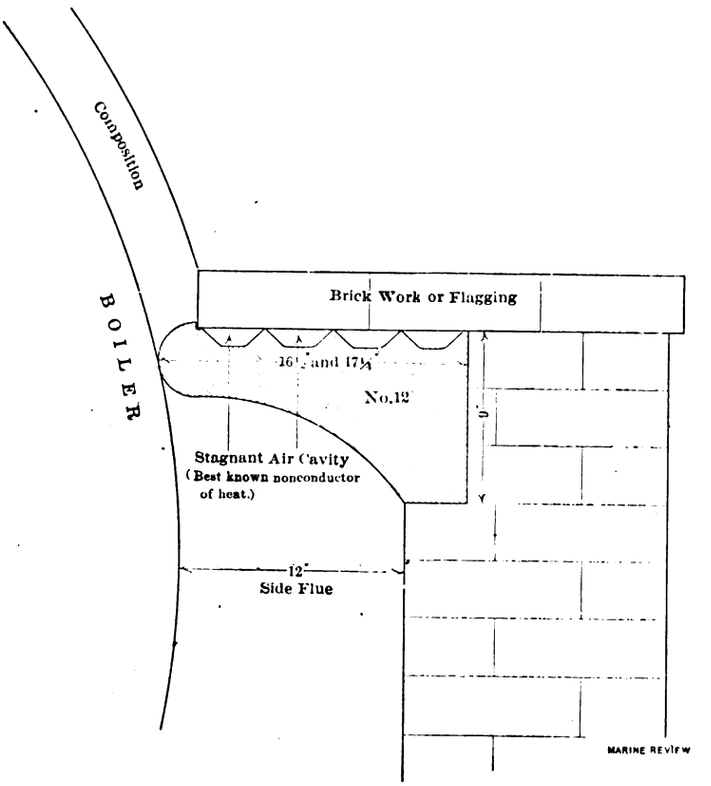


FIG. 2.—POULTON'S PATENT CURVILINEAR INSULATING FLUE COVERS.

She is to be fitted with Parsons steam-turbines, and is expected to do 19 knots with about 17,000 I. H. P. The turbines have been shipped out from the Tyne, having been constructed by the Parsons company at Wallsend; the same will be the case with the second ship, which is to be named the Chiyo Maru. But the Mitsubishi works have for some time past been making careful preparations for the construction, under license, by themselves of the Parsons turbine; and the third ship, as well as a Japanese volunteer fleet steamer of 3,500 tons, will be supplied with turbines of their own construction.

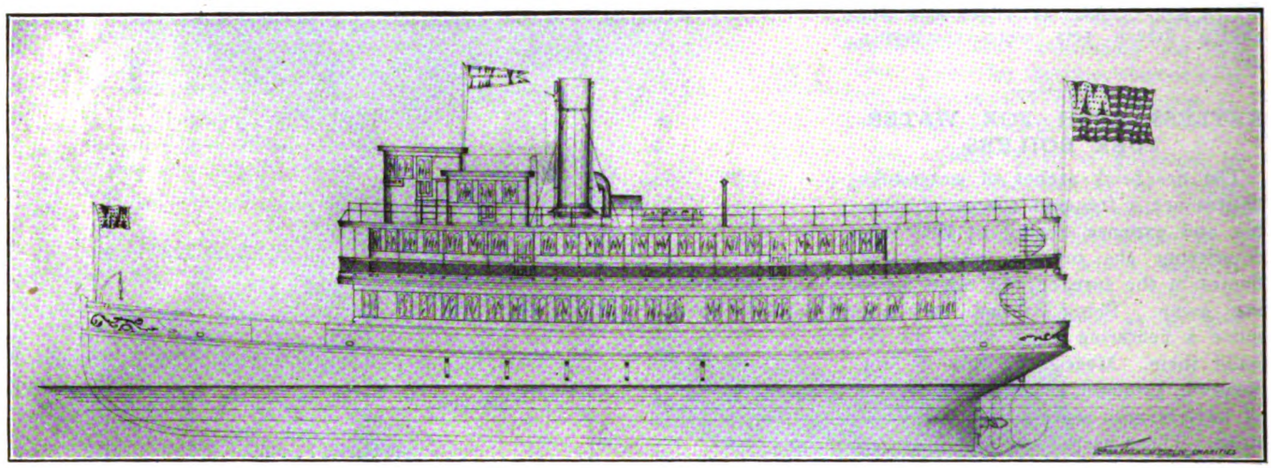
The keel of the Tenyo Maru was laid in November, 1905, but on account of the considerable delay in the arrival of the raw materials from England, the work was practically not commenced till May, 1906, and about 8,000 tons of steel were worked into her before the launch. Thus she also earns the credit of being the heaviest ship launched in the country.

At the launch of the Tenyo Maru there were present Dr. S. Myoshi and

Mr. Tsutsumi, representing the department of communications; Rear Admiral Taketomi and Captain Kondo, representing the Japanese navy; Mr. and Mrs. Heron; Mr. Aitken of Lloyds Register; Mr. Asana, president of the Toyokisen Kaisha, and Mrs. Asano; Baron Mayeshima; Mr. Tsukahara; Mr. Shiraishi, director of the same company, and Mrs. Shiraishi; Captain Tomioka, chief superintendent; Mr. Hara and Mr. Nakayama, assistant superintendents of the company; Profs. Terano and Shiba, of the Tokio Imperial University, designers of the hull and machinery of the Tenyo Maru; Professor Suehiro, from the same university; Mr. Shoda, representing the builders, with Mr. Maruta, the general manager; Mr. Sugitani and Mr. Hamada, the assistant managers; Mr. Kato, ship yard manager; Mr. Esaki, engine works manager; Mr. Yamamoto, chief designer; Mr. Clark and Mr. Shaw, advisers to the Mitsubishi company; the local governors, the foreign consuls, and a large number of distinguished Japanese and foreign residents of the town were also present.

The launch was in all matters very successfully conducted, the naming ceremony being performed by Mrs. Asano, the wife of the president of the Toyokishen Kaisha. Every possible care was taken in the process of releasing the ship, and many distinct and pre-arranged electric-bell signals emanated from the ship yard manager, each being obeyed and replied to before the next order was passed. In order to avoid any possible danger which might occur by hanging such a big ship on the dog-shores alone, keel blocks under the forward part of the ship, about 50 in number, had canvas bags containing sand put in between the wood blocks, instead of being built up entirely of wood, and were left in place till the last moment; the sand bags were ripped open just after the dog-shores had been knocked down by the falling weights, and the sand allowed to escape; pressure on the blocks was thus rapidly released, and the total weight brought on the launching ways.

During the launch some interesting experiments were made upon the strains occurring at the various decks. For the use of students at the Imperial University a couple of Stromeyer indicators were recently obtained; these were placed on the upper deck and shelter deck respectively, while at the promenade and boat decks (at each of which is an expansion joint) movements were measured by less delicate means. In this way variations of form on four different decks were obtained simultaneously during the launch, the results of which, when analyzed, will doubtless be of value and of interest.



HOSPITAL STEAMER FOR ATLANTIC CHARITIES.

HOSPITAL STEAMER.

The department of Atlantic charities of New York City has awarded contract to the F. A. Verdon Co., New Brighton, S. I., New York, for the construction of the steamer Lowell intended for ferry service between New York City and various islands on which charity hospitals and institutions of that character are located. It is the intention to use the steamer for transferring patients in ambulances, the ambulances and horses being taken right on board and delivered to the various islands. The steamer is also designed as an excursion steamer for convalescent patients. The steamer is built of wood and is of the following dimensions:

Length on deck	134 ft. 6 in.
Length on load line	119 ft. 6 in.
Breadth, molded	27 ft. 6 in.
Breadth on deck	32 ft. 6 in.
Depth molded at frame	35 ft. 11 in.
Draught	9 ft.

The propelling machinery consists of one compound surface condensing engine, having cylinders 15 and 30 in. diameters by 20 in. stroke. Steam is furnished by one Scotch boiler, 11 ft. in diameter by 11 ft. 5 in. long, having two 42-in. corrugated furnaces and allowed a working pressure of 150 lbs. A complete electric light plant of 15 K. W. capacity is to be furnished. Eight ward rooms, physicians' and nurses' offices are located on the main deck aft of the engine room. The floors of these rooms are to be covered with Sawdolet cement and the sides up to a height of 4 ft. are to be covered with enameled tiling. Every precaution has been taken to make all details as sanitary as possible. The steamer was designed by M. C. Furstenau, naval architect, 308 Walnut street, Philadelphia, Pa.

The Metallic Packing & Mfg. Co., 1100 Schofield building, Cleveland, has just put out a folder devoted to Twentieth Century frictionless packing, for which it makes the claim that it is most efficient, more durable, most simple and most economical.

The Keuffel & Esser Co., 127 Fulton street, New York, has issued an illustrated price list of nautical instruments manufactured by them. The list includes every instrument needful aboard ship. Each device is well illustrated and well described.

HALL BROTHERS' SHIP BUILDING PLANT

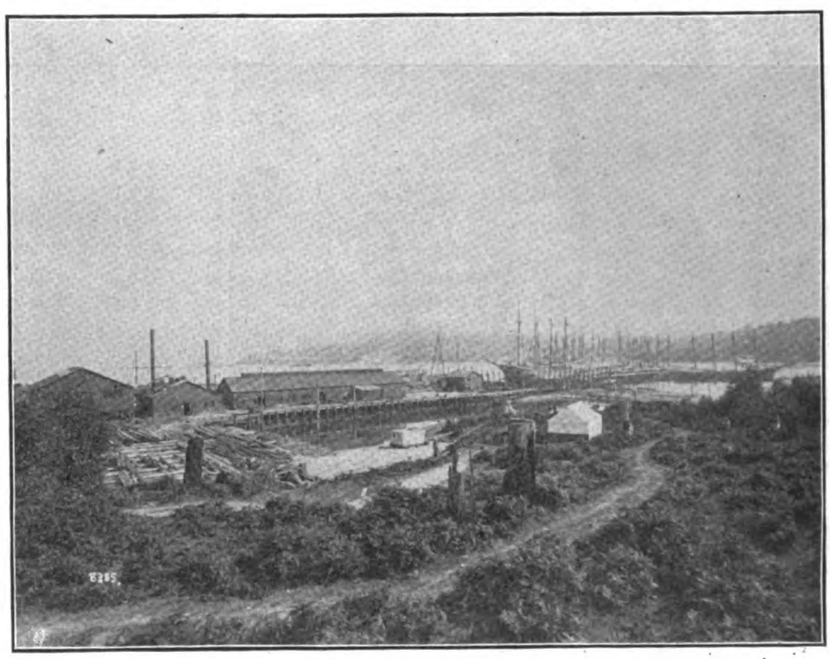
The Oldest Enterprise of Its Kind on Puget Sound

H. COLE ESTEP

In the good old days when the American square rigger was a much more frequent sight in the ports of the world than it is today two master ship builders from Masschusetts made the long journey across the continent and established at Eagle Harbor, on Puget Sound, eight miles west of Seattle, Wash., the works and ship yard of what is now the Hall Brothers Marine Railway & Ship Building Co. This was in 1875; one of the brothers, H. K. Hall, is yet living and now resides at Winslow, Wash. Although an old man and retired from active business, he still takes a keen interest in the affairs of the ship yard.

VIEW OF HALL BROS. PLANT FROM THE WATER FRONT.

The Hall brothers were ship builders of the old school; their plant was the pioneer one on the north Pacific coast and early became renowned for its fine square riggers and barks. The first large vessels were the barks Hesper and Albert, built about 1880 of Washington timber throughout; they were thoroughly made and are in service yet. But the decline of American shipping, more severe on the Pacific than on the Atlantic, soon put an end to the construction of square rigged ships. Not a single ship of this type has been built on the Pacific coast for twenty years. Hall Brothers therefore turned their attention to the construction of coasting schooners, both steam and sail. Before retiring from business they built over 100 vessels of this type, most of which are still in service.



VIEW OF HALL BROS. PLANT FROM THE LAND SIDE.

In 1906, wishing to retire from active life, the original owners sold their interest in the firm to a company of San Francisco capitalists and ship owners who incorporated under the name, Hall Brothers Marine Railway & Ship Building Co., retaining the name of Hall Brothers as a part of the new title. The officers of the new incorporation are: George E. Billings, president; H. S. Hains, secretary; John L. Hubbard, vice president and general manager. The firm is incorporated in the state of Washington with a paid up capital of $500,000.

Eagle Harbor is a deep, completely land-locked bay entering the east shore of Bainbridge Island and is situated eight miles due west of Seattle, in full view of the city. On account of the deep water, excellent beach and absolute protection from storms the site is ideal for a ship building plant.

The company owns 96 acres of land on the north shore of this bay with one-half mile of water front and tide land. The property includes a water power that could be and should be developed to operate the plant. The plant proper is located on a flat plat of ground adjacent to the shore; the

buildings and grounds are arranged approximately in the form of an equilateral triangle. The hypothenuse, 1,000 ft. long, lies along the shore, including the wharves and offices; along one of the 700-ft. legs are arranged the ship building cradles, of which there is room for five; back of them is the storage shed for finished lumber, while along the other leg is the mill, power plant, machine and forge shops and marine railway. The plant employs 300 men.

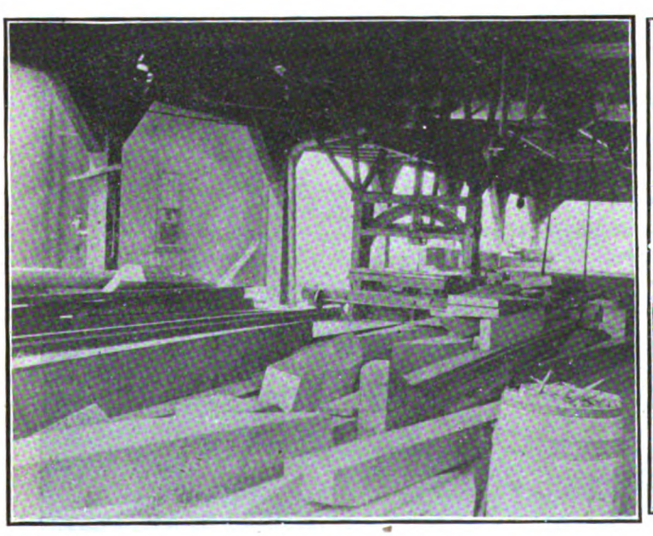
The mill is a heavy two-story frame building 80 by 140 ft. The second floor is used as a boat and fitting shop and contains lathes, band saws and other light wood-working tools. On the lower floor are the planer, large band saw and heavy wood-working tools. All the knees, stem and stern pieces used in the vessels built at the works are fashioned from solid, natural bent fir sticks which are worked into shape at this mill. Back of the mill is the material yard, served by an efficient single rail overhead trolley. In front of the mill is a large open shed for the storage of finished lumber.

The mill is situated at the apex of the triangle, just north of it are the power plant and metal working shops. The power house is a corrugated iron structure. The plant includes a 340 H. P. Corliss engine operating the mill and two large horizontal air compressors for furnishing compressed air for use about the works. The air is piped to every part of the yard and wherever possible pneumatic tools are used. A 100-H. P. simple engine belted to a 70-K. W., 110-volt direct current generator furnishes light and electric power. The boiler plant includes four return tubular boilers burning crude oil. The plant consumes 22 bbls. of oil a day, costing $1 a barrel; 2½ bbls. of oil are equivalent to one ton of coal costing from $4 to $6 according to quality. Aside from its cleanliness and decreased labor expense the oil allows a very marked saving in fuel bills.

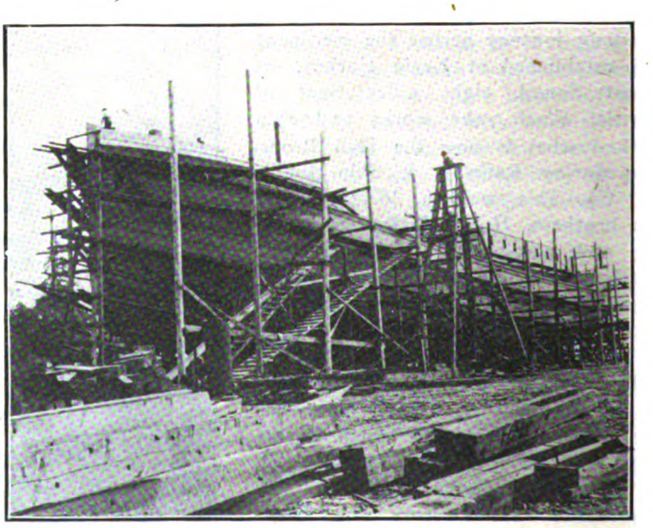
The machine shop is 150 by 75 ft. in size and contains the usual array of machine tools; these include a 10-ft. radial drill, Hilles & Jones shears with 4-ft. gap, a Hilles & Jones punch with a capacity of a 1½-in. hole through a 1½-in. plate and a 40-ft. shaft lathe with a 36-in. swing. The shop is provided with a modern tool room and the tools are ground and forged by experts. High speed steel is used. The machines are driven by an

GENERAL VIEW OF THE MILL AND POWER PLANT.

EXTERIOR OF MACHINE SHOP AND FORGE SHOP.



INTERIOR OF THE MILL.

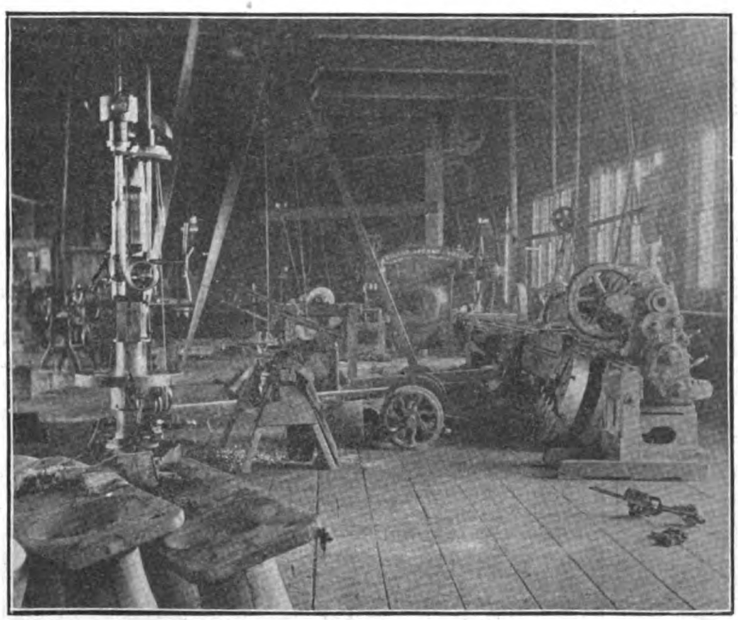


THE STEAM SCHOONER SHNAYAK UNDER CONSTRUCTION.

isolated 20-H. P. steam engine through the usual system of line and counter shafting. In view of the ease with which modern electric drive could be installed this system is not in keeping with the up-to-date equipment of the rest of the plant.

Following the machine shop is the forge shop, 100 by 100 ft. in size. The equipment is modern and includes a 15-ton Bement-Niles steam hammer.

We next come to the most interesting feature of the works—the marine railway. It is the largest marine railway in the United States if not in the world and can handle a 4,000-ton ship with ease. The keel blocks and cradle are supported on a stout structural steel frame running on four tracks with steel rails having a 10-in. face. These tracks extend out to deep water on an incline. When a ship is to be docked the cradle is run out to the end of the track, the vessel is floated over the keel blocks and when all is fast the cradle and ship are hauled ashore by a 350- H. P. "hauling engine" specially designed and geared for the purpose. The marine railway was designed by Crandall & Son, of Boston; the dimensions are: Length, 350 ft.; breadth inside, 70 ft. The railway is an unqualified success both from an operative and economic standpoint; for general repair purposes, handling ships under 4,000 tons, it has proven itself to be decidedly superior to a graving dock. The advantages of the railway are: A ship can be docked more rapidly and economically; once docked

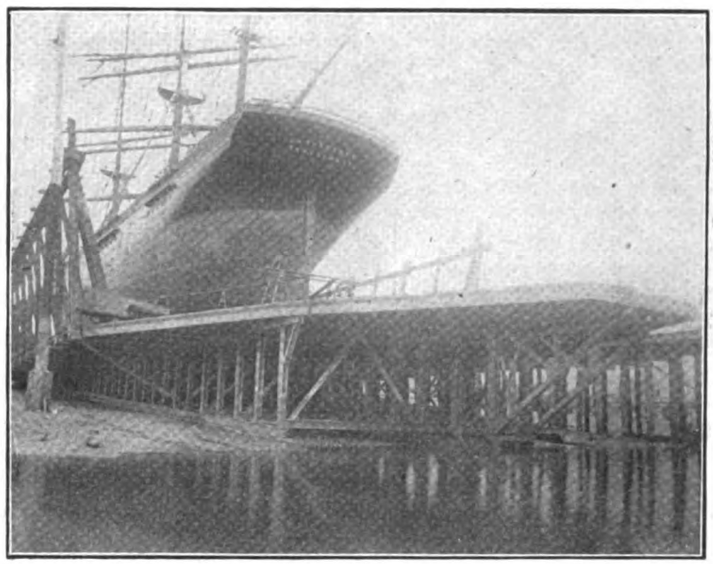


INTERIOR OF MACHINE SHOP, HALL BROS. PLANT.

the air has free access to all sides thus assisting materially in drying and painting operations; the vessel being up in the air and accessible can be repaired more rapidly and economically than in the more inaccessible graving dock. It is claimed that the railway is better than a floating dock on account of cheaper cost of construction, maintenance and greater reliability. This railway has been in operation since 1903; an average of 125 vessels a year has been hauled out, all without slip or accident.

While the marine railway is well known to be efficient in handling small vessels the success that has been achieved with this one in handling large, heavy craft commends the design to those who are considering the erection of plants for the repair of large vessels.

The internal transportation about the works is effected by a complete standard gage railway system reaching the marine railway and all the docks and shops.



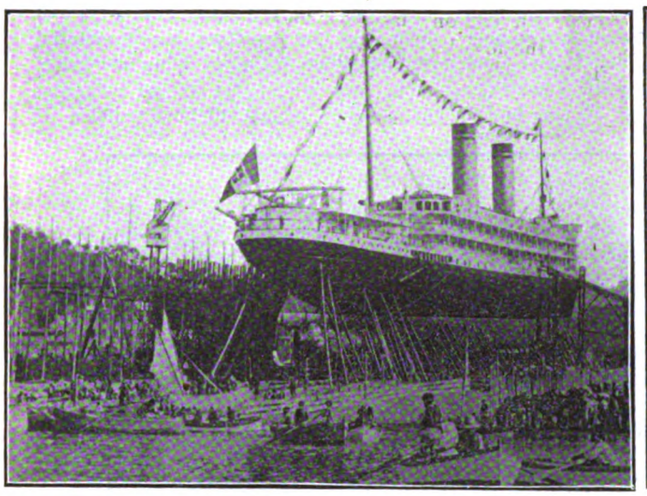
A LARGE SAILING VESSEL ON THE MARINE RAILWAY.

One wharf is provided with a 40-ton shear legs for handling heavy material and machinery in ships lying alongside.

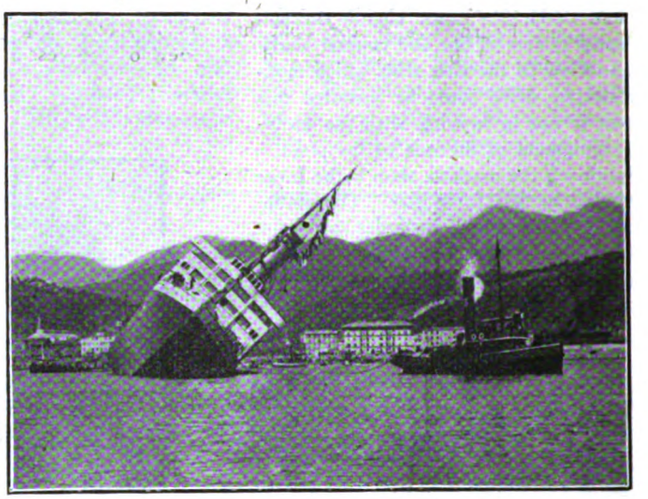
The firm are on the eve of enlarging the plant to include the construction of steel ships, boilers and engines. At present practically all of the work is confined to wooden vessels of two classes, peculiarly adapted to Pacific coast needs, namely, sail and steam coasting schooners. Among the most recently constructed at this plant may be mentioned the S. S. Norwood, J. B. Stetson, S. S. Delphi and S. S. Shna-yak, just completed These vessels are of a particularly heavy, massive type of wooden craft that have proven themselves superior in bar and coasting work to steel ships; in case of grounding they are able to stand the pounding on rocky shores much better. A typical one of these is the Shna-yak, mentioned above. It is 200 ft. long, 40 ft. beam, 14 ft. deep, 800 tons gross burden, with a capacity of 1,000,000 ft. of lumber.

The labor situation, coast conditions considered, is good. The men are well treated and satisfied. Wages are good. Caulkers are paid $5.00 and carpenters $4.50 per day; machinists' and others' wages are in proportion. The company is following the admirable policy of building up a permanent force of skilled artisans; good, skillful, steady men, who will live near the plant and own their own homes. Every reasonable assistance is given in aiding men of this character in establishing themselves.

Since the organization of the present corporation and its predecessor, the Hall Bros., there has been built at this yard 125 vessels embracing practically every type of wooden craft from small steamers, government revenue cutters, coasting schooners and freight steamers up to five-masted ships.



THE PRINCIPESSA JOLANDO BEFORE LAUNCHING.



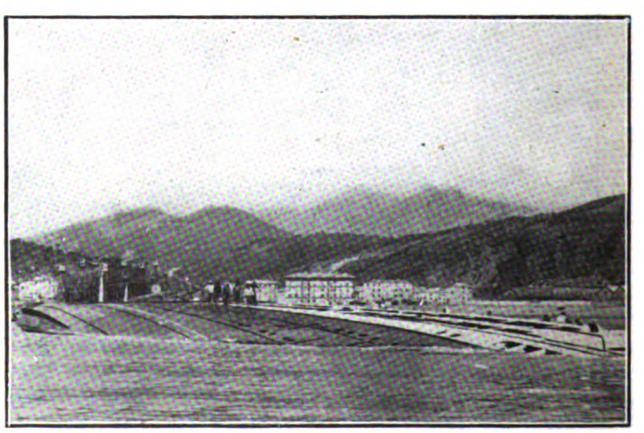
THE PRINCIPESSA JOLANDO HEELING TO PORT.

LAUNCHING DISASTER TO THE PRINCIPESSA JOLANDO.

The accompanying illustrations, unique in their way, tell their own story of the misfortune which befell the new mail steamer Principessa Jolando, built for Lloyd Sabando, of Genoa, while being launched from the yard of Soc. Exercizio Bacini, at Sestro Levanti, near Genoa, on Sept. 22. The Principessa Jolando was built by Messrs. Piaggio & Co., of Genoa, and was intended for the River Plate trade. She was the largest vessel built in Italy, being of about 8,000 tons, deadweight, and the disaster she has met with has naturally created an intense sensation throughout ship building circles the world over. It appears that the vessel while going down the ways took a list to port owing to the cradle breaking, and without recovering her equilibrium, she sank broadside gradually, and after some 20 minutes touched bottom. She now lies in 48 ft. fore and 60 ft. aft on a shingle bottom, her starboard broadside being visible above water as shown in one of our illustrations. The well-known wreck officer of the Liverpool Salvage Association, Captain F. Young, has been despatched to Genoa with a view to advising, and if if necessary carrying on any salvage operations. At the time of writing, however, these do not appear to be promising. A telegram from Genoa says that the sea is running high and no boats can go out, and the salvage operations have practically been abandoned. Judging from objects that have been found there is reason to fear that she is breaking up. In regard to her salvage two points need clearing up. There has, first of all, been a suggestion (which has come from Italy) that there was some "foul play" at the bottom of the trouble. The second point is that although the insurance for the whole risk was covered in France and Italy, for some £240,000—the finished value of the steamer—only a few weeks before an amount of £80,000 was reinsured by these companies at Lloyd's to cover the risk of launching and trial trip, the usual rate of 3s 4d being paid. The steamer was launched with all her machinery on board, for it was intended that she should be delivered to the owners after her trials about Oct. 1 and sail from Genoa on Nov. 1. She was, therefore, being put into the water practically a finished ship, and underwriters in London find themselves caught with a heavy loss, for even if she is refloated, the claim is sure to be a serious one.

The Isthmian Canal Commission has purchased the tug Catherine Moran for use on the Pacific side of the canal, and she is being fitted out in New York, preparatory to her 12,000-mile trip around the Horn. It is estimated that it will take eighty days for the voyage, including stops at St. Lucia, Pernambuco, Montevideo, Coronel and Callao. The tug is 110 ft. long, 23 ft. beam and 13 ft. depth of hold. She was owned by the Moran Towing & Transportation Co. of New York.

THF PRINCIPESSA JOLANDO ENTERING THE WATER.



THE PRINCIPESSA JOLANDO BROADSIDE VISIBLE ONLY.

HYDROPLANE MOTOR BOAT.

A new hydroplane motor boat has been designed by A. Crocco and O. Ricaldoni, of the Bryata Specialiste, in Rome. The little vessel has been built in the yard of M. Baglietto, at Varazze, on the Gulf of Genoa, and has been run on the lake of Bracciano, near Rome. The length of the boat is 26 ft. 3 in. and, she is fitted with a Clement-Bayard 80-100-H. P. motor, having cylinders 180 millimeters by 180 millimeters (7.09 in. by 7.09 in.), and working at a speed of 1,200 R. P. M. It will be seen from the views we publish that the boat is provided with hydroplanes only at its stem and stern. The planes at the bow are arranged in the manner of a V, while those aft, though similarly disposed, do not join at the inverted apex. These planes, and the principal members of the frames supporting them, are made of steel plating, the remaining parts of the carrier frames being of aluminum. Their arrangement is clearly seen in Fig. 1, which gives a broadside view of the boat, suspended with its stem towards the right hand. Fig. 3 shows an end-on view of the vessel showing the low V-shaped plane, while Fig. 4 shows the arrangement at the stern. Fig. 2 also shows the arrangement at the stern. Fig. 2 also shows the stern of the boat, and this, with the other views, gives a good idea of the arrangement of the aerial propellers. These propellers are of doubled aluminum plating, and weigh each about 12 kilograms (26.4 lbs.). Their pitch can be altered while running and they can be reversed. The propellers are mounted on frames of aluminum sheeting, which, together with the shafts, gear, transmission and controlling devices, etc., weigh 300 kilograms (660 lbs.). The weight of the motor is also 300 kilograms (660 lbs.). Including all machinery, fuel, etc., and two men on board, the vessel weighs 1,500 kilograms (3,300 lbs.). When running the boat rises, so that the hull is clear of the water, and at the speed of 70 kilometers per hour (43.5 miles per hour) which has been obtained by this novel form of vessel, the hull is about 18 in. out of the water. Fig. 5 shows the boat at full speed, supported solely by the V-shaped planes, the hull being clear of the water as described.

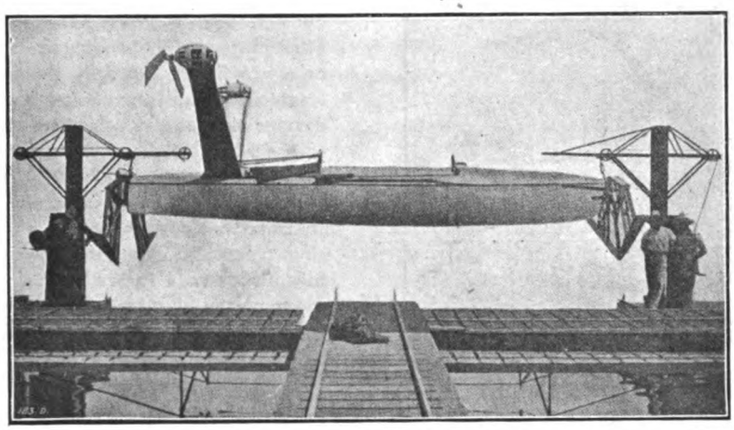


FIG. 1.—VIEW OF THE VESSEL SUSPENDED, WITH ITS STEM TO THE RIGHT.

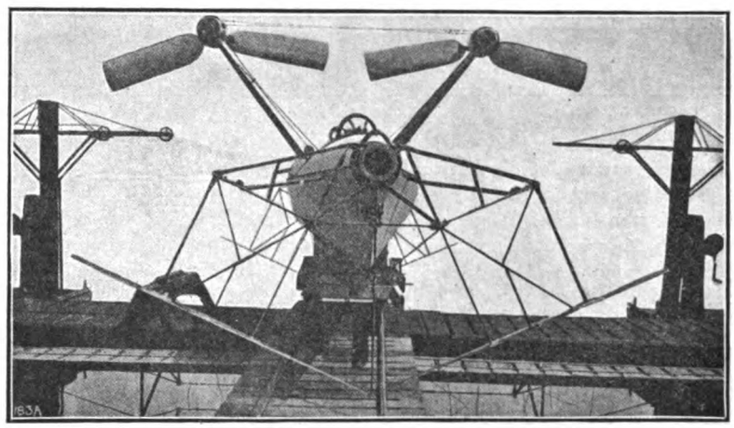


FIG. 3.—THE LOW V-SHAPED PLANE AT THE STEM OF THE VESSEL.

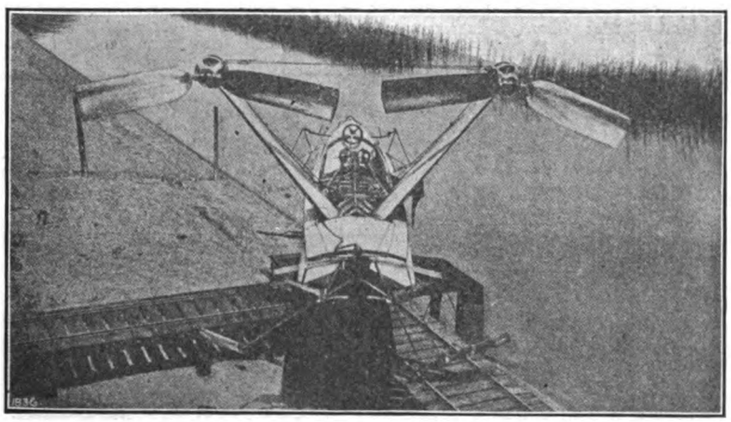


FIG. 2.—STERN VIEW OF THE VESSEL.

We are informed by the inventors of this novel type of boat that on commencing a run, when a speed of about 10 kilometers (6.2 miles) per hour is attained, the bows begin to lift in the water, and the fore fins slowly emerge as the speed increases. At a speed of 25 kilometers (15.5 miles per hour the hull is wholly out of the water, only the flat portion near the stern skimming on the surface. At from 30 to 35 kilometers (18.6 to 21.7 miles) the boat is supported solely by the V-shaped planes; and at the highest speeds yet attained the hull is, as we have already stated, 18 in. out of the water. It has been found that waves of a height of 20 centimeters (7.87 in.) do not affect the vessel, as at the high speeds the hull stands quite clear of the tops of waves of this size. Trials of a length of 6 kilometers (3.73 miles) have been run, and sharp turns have

been taken while running. After a certain amount of further experimental work, the inventors propose to put the boat through still more exhaustive trials, under as varied conditions as possible.—*Engineering*, London.

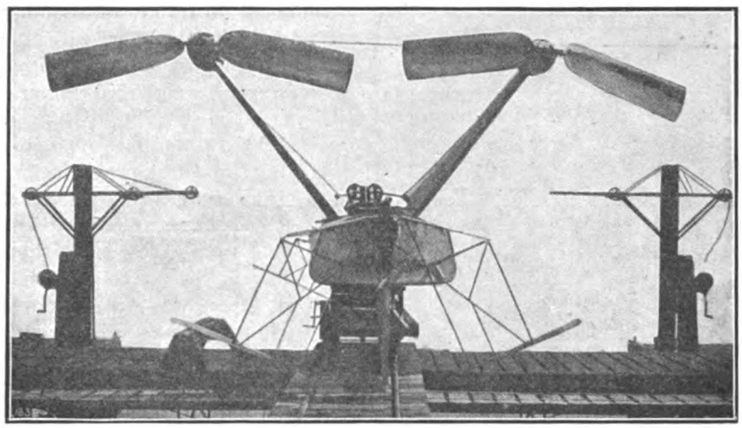


FIG. 4.—ARRANGEMENT OF THE PLANE AT THE STERN.

THE STOCKLESS ANCHOR.

Though the anchor, as we know it, was invented in 587 A. D., the necessity of some anchoring material was recognized by the navigators of the stone age, or their predecessors, their inventive faculties producing anchors in the shape of blocks of stone, sacks filled with sand, and weighted logs of timber. Later came logs loaded with lead or other metal. The Tuscans, with a view to producing an anchor which would be more securely fixed at the bottom and proof against the dragging force of the currents, introduced a toothed piece or fluke on the anchors of that period. Ultimately another fluke was added, producing the original of the type in vogue till the present day. To enable one of the flukes to become imbedded in the ground at all times, the anchor was made to fall in position by the addition of the stock.

Until recent years the anchor most in use consisted of "a long bar or shank of iron branching out in the lower extremity into two arms ending in flukes barbed at their extremities and with a stock of oak or wood at the upper one, while it terminates in a ring to which a rope or chain is affixed" according to a recently published encyclopediacal description of a modern anchor.

In the modern anchor the stock is dispensed with, and the flukes are so arranged as to adjust themselves to the position of the anchor, whether it lies at the bottom of a harbor or is hove up to the bow of the vessel. With this type of anchor security is assured, as it cannot be wrenched from its bed and dragged forward by the violence of the weather or the straight pull of the current. Its simplicity of construction prevents the cable becoming entangled, a fault of the old stock type of anchor, causing loss of time and ofttimes the anchor. In the stockless anchor, also, the flukes become imbedded simultaneously, making the anchorage doubly secure. Unlike the large cumbersome anchors formerly built, the largest size of stockless anchor is easily handled and adjusted when hove up.

The stockless anchor invented by Fred'k Baldt Sr., and now manufactured by the Admiral Anchor Co., of Chester, Pa., was first placed on the market in 1901, and is one of the latest and best of its type. The Admiral anchor is made in all sizes from 40 lbs. upwards, and possesses all the admirable features of the up-to-date stockless anchor. The Minnesota, of the Great Northern Steamship Co., and the largest ship in the American merchant marine, is equipped with Admiral stockless anchors, each of which weighs actually 17,100 lbs. Among the yards handling the Admiral anchors may be mentioned the Great Lakes Engineering Works, Wm. Cramp & Sons, Maryland Steel Co., American Ship Building Co., and the New York Ship Building Co.

A combined hawse pipe and anchor pocket is now being introduced in conjunction with the Admiral anchor, the main feature of which is that the anchor can be stowed in the pipe, leaving practically no obstruction on the outside of the vessel, avoiding to a great extent the danger of collision when in close quarters with other vessels or docks. Anchors, as now fitted projecting or hanging from the bow of a vessel, are generally the first thing to catch, and in many cases cause more damage than the vessels themselves, and, as the heads of the anchors project outside of the vessel from two to five feet, are a great detriment in heavy weather. In using the pocket the head of the anchor practically closes the hawse hole on the outside and prevents the rush of water up the pipes as at present. The inventor of the pocket is Joseph Kidd, Palladio building, Duluth, Minn.

Major George A. Zinn, Corps of Engineers, Portland, Me., recently opened bids for building training walls and dredging in Kennebec river below Gardner, Me. The bidders for training walls were: Philip H. Doyen, South Portland, Me., at $3,400, and Rowe Bros. Co., Richmond, Me., at $2,776. The dredging bids were Simon J. Donovan, Boston, Mass., $196,020; Eastern Dredging Co., Boston, Mass., $160,180.50. Contract was awarded to the lowest bidders in each case.

Capt. J. B. Cavanaugh, corps of engineers, Montgomery, Ala., has awarded contract to G. A. Langley, Pensacola, Fla., upon his bid of $1,375 for removing the wreck of the tug Florence Witherbee at Pensacola. The other bidder was E. E. Saunders, Pensacola, Fla., at $1,895.

The North German Lloyd Steamship Co. will, after Jan. 1, 1908, have the exclusive control and management of the Mediterranean service which has heretofore been conducted by the German Levant line, and will add to the line their steamers Bayern, Sachsen and Preussen, each of 5,500 tons and 4,000 H. P.

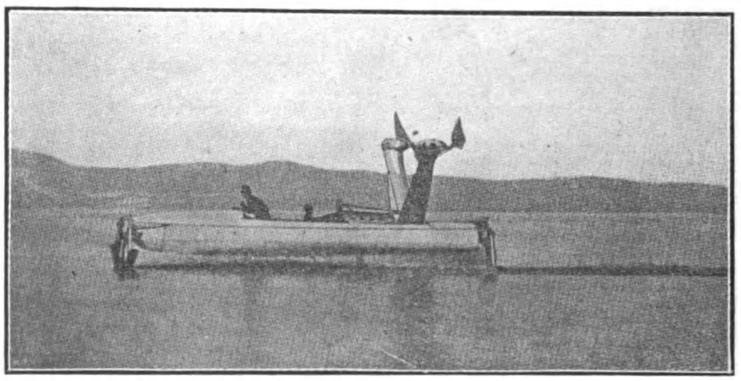


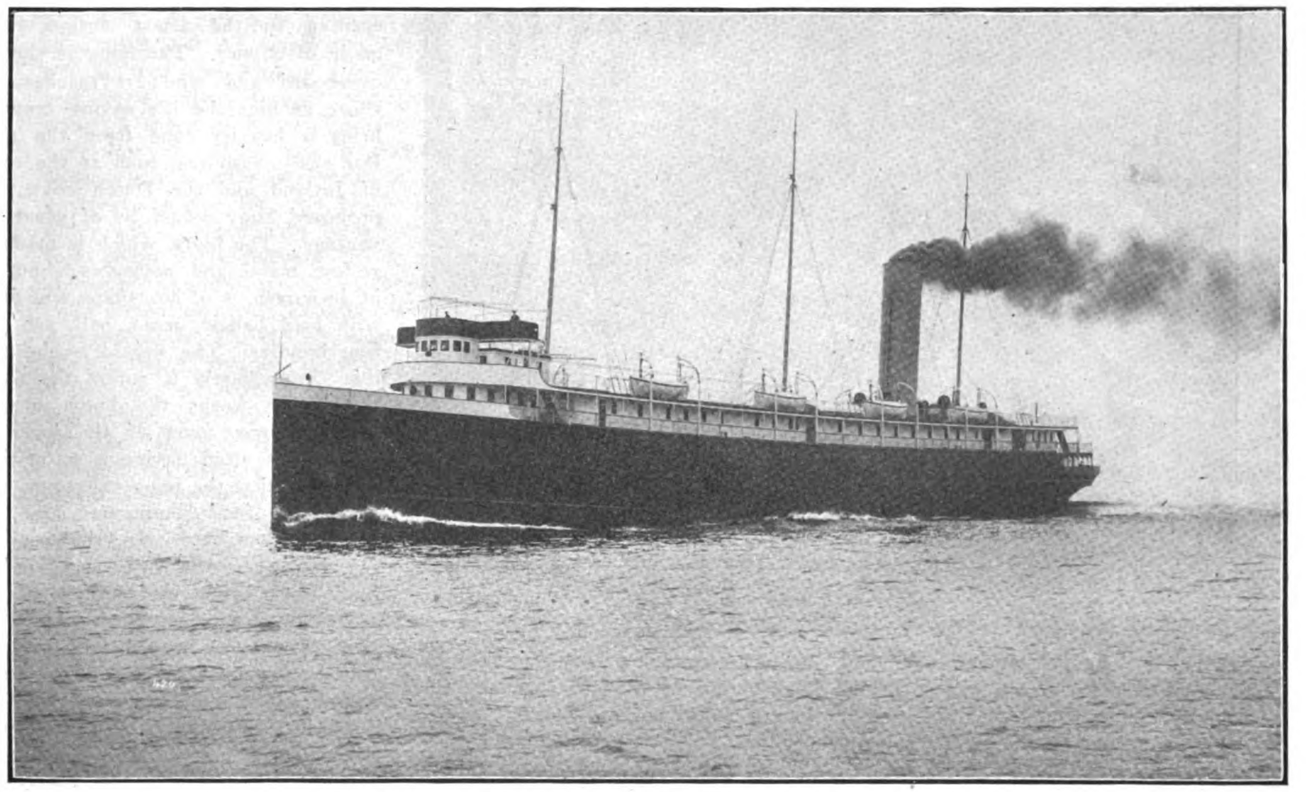
FIG. 5.

C. P. R. STEAMERS FOR THE GREAT LAKES.

The Fairfield Ship Building & Engineering Co., Ltd., Govan, Scotland, has completed the building of the two steel screw steamers, Assiniboia and Keewatin for the Canadian Pacific Railway Co.'s service on the great lakes of North America. Our illustration, which is from a photograph supplied by the builders, shows the Keewatin ready to cross the Atlantic for delivery to her owners. Both the Assiniboia and Keewatin are identical in every detail, and have been specially constructed so that on reaching Canadian waters they can be divided amidships into two parts, each part being towed separately through the canals which lead to the great lakes, where the sections will be again rejoined. Water-tight bulkheads have been constructed on either side of the dividing line. The cutting in two of these vessels has had to be provided for owing to their length exceeding the length of the locks leading to the great lakes. The sections have to be towed through a couple of canals and a lake of about 160 miles in length before reaching the shores of the great lakes. The new ships are fine specimens of lake passenger craft, and their dimensions are as under: Length, 348 ft.; breadth, 43 ft. 6 in.; depth, 26 ft. 9 in. to awning deck; with a gross tonnage of 4,300 tons. There are four decks—main, awning, promenade and hurricane. In the fore part of the ships there are three compartments for grain or other cargo; the former will be put on board through trunked hatches from the hurricane deck, and the handling of the cargo will be accomplished by means of an overhead revolving shaft, 140 ft. long. The awning deck is arranged for the accommodation of 195 first class passengers in two and three-berth rooms, equipped in the most modern style. There are, in addition, five cabins de luxe, panelled in mahogany and oak. The central hall of the awning deck is 140 ft. in length, and above it on the promenade deck is a second spacious room with a well in the center. On either side accommodation is found for 70 first class passengers in three-berth staterooms, similarly furnished to those on the awning deck. The drawing room in the promenade deck house is tastefully finished in white enamel and gold; the dining saloon capable of seating 116 passengers, is framed in American walnut with Italian walnut panels. The smoking room is in light fumed oak with carved panels. The propelling machinery consists of a set of quadruple-expansion engines, having four cylinders working on four cranks balanced on the Zarrow, Schlick and Tweedy system. The boilers are of the cylindrical return tube type, four in number, and arranged to work with natural draft. They are constructed entirely of steel for a working pressure of 220 lbs.

It may be recalled that at the launch of the Assiniboia, on June 25, Arthur Piers, steamship manager of the C. P. R., said the enormous development of trade in Canada meant that these new vessels and many more would be required on the inland waterways.

It is just announced on good authority that the Canadian Pacific Railway Co. has just placed an order with the Fairfield company for a first class passenger and cargo steamer, 330 ft. long, for the C. P. R. Co.'s quick transit service between Vancouver and Japan. It has not yet been decided whether the new boat will be fitted with turbines or reciprocating engines.

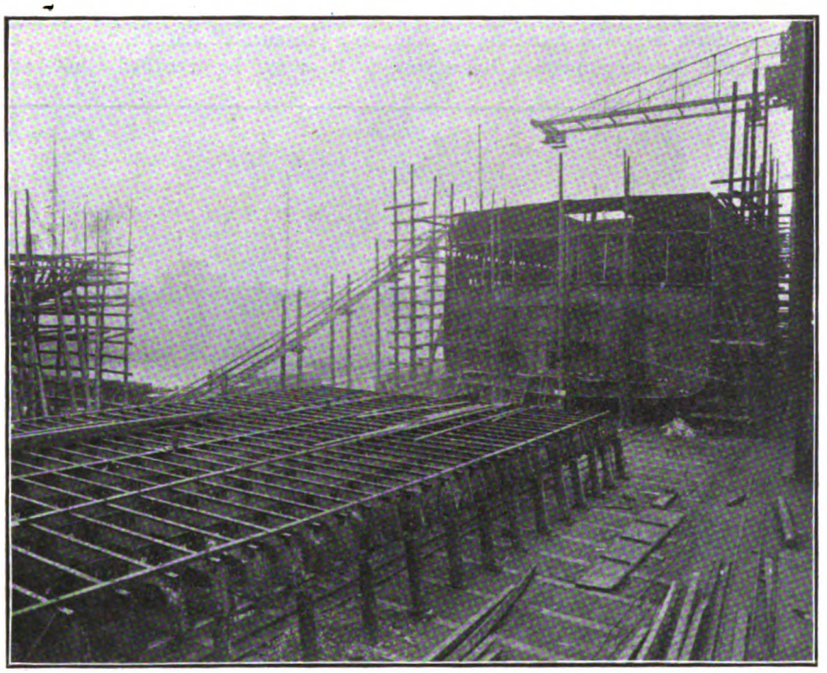


THE CANADIAN PACIFIC RAILWAY'S LAKE STEAMER KEEWATIN.

The Simplex Electric Heating Co., Sydney and Auburn streets, Cambridge, Mass., has just issued a catalog in which is described completely the electrically heated pressing irons.

THE SUEVIC'S NEW BOW.

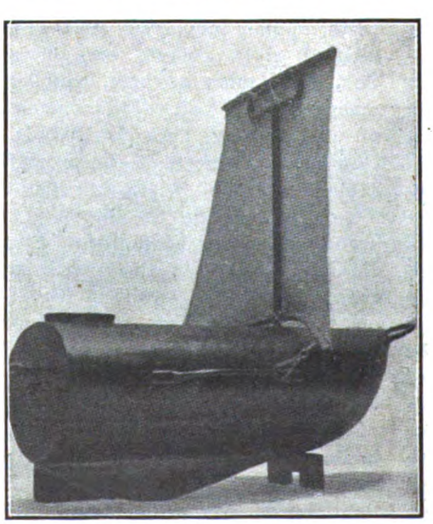
On Saturday, Oct. 5, Messrs. Harland & Wolff, of Belfast, launched the new forepart of the Suevic, the White Star Australian liner of 12,000 tons, which went ashore in the English channel about six months ago. The Suevic, it will be remembered, had her bottom pierced, and was so firmly held by the rock underneath her, that the only means of effecting a salvage of the ship and valuable cargo, was to cut her in two, the division being, in the end, made forward of the machinery, and in this way about two-thirds of the ship was successfully saved. The after part was afterwards towed to Southampton and there docked pending the construction of a new bow. Our illustration, reproduced from a photograph supplied by the builders, shows this new bow just before launching. This peculiar structure had for obvious reasons to be launched bow first, and much care and calculation has been necessary to ensure proper flotation and trim for the subsequent towage to Southampton. But the great experience of the builders has enabled them to accomplish this without any fear of a mishap occurring. Our illustration shows the structure at its midship extremity, where, as will be seen, there is a water-tight bulkhead designed to fit into the structure of the complete ship as regards water-tight hold compartments. Space is valuable at the great Belfast establishment, and it will be observed that the structural bottom of another vessel occupies part of the berth. This, of course, will be carried to its full length now that the new part of the Suevic is floated. The length of the new part is from 180 ft. to 185 ft., so that when joined up with the corresponding strakes and butt distribution of the old part, the total length will be as before, namely, 550 ft.



THE SUEVIC'S NEW BOW.

BREDSDORFF'S SHIP'S STRANDING BUOY.

Mr. Th. Bredsdorff, director of the Flensburger Ship Building Co., Flensburg, has invented a stranding buoy, which is creating great interest amongst the sea-faring profession. The great disaster last winter at Hook of Holland caused the inventor to study why a ship's crew should not have the means enabling it to communicate with the shore in case of stranding or other disaster to the vessel. This, he thought, could be accomplished by means of a buoy fitted with a small sail and having a thin line attached to it, as shown in the accompanying illustration. According to the latest design it is made of copper. The buoy is thrown overboard and when it reaches the shore enables the life saving crew to bring a heavier rope from the ship. For shallow shores, such as the coast of Jutland and the Dutch coast, the proposed buoy would be of great advantage. The buoy, which is made of yellow metal and measures about 32 in. in length, is of boatshape and fitted with lead ballast, mast, bell, sail and four handles. The weight is about 25 lbs. Immediately it enters the water the ballast keeps the buoy upright. On the upper part of the buoy an aperture is fitted having a water-tight cover, so that the buoy can serve as a receptacle for documents, and the ship's papers, etc. In the case of foundering in the open sea such a buoy will bring information of the vessel to those concerned. The little boat is painted in a bright red and can be easily seen by any passing vessel. It should be noted that the Bredsdorff stranding buoy is also a life buoy, being capable of supporting three persons in the water, and it is also very useful for bringing a line on board a pilot boat in a very heavy sea. It is arranged also to contain provisions.



SHIP'S STRANDING BUOY.

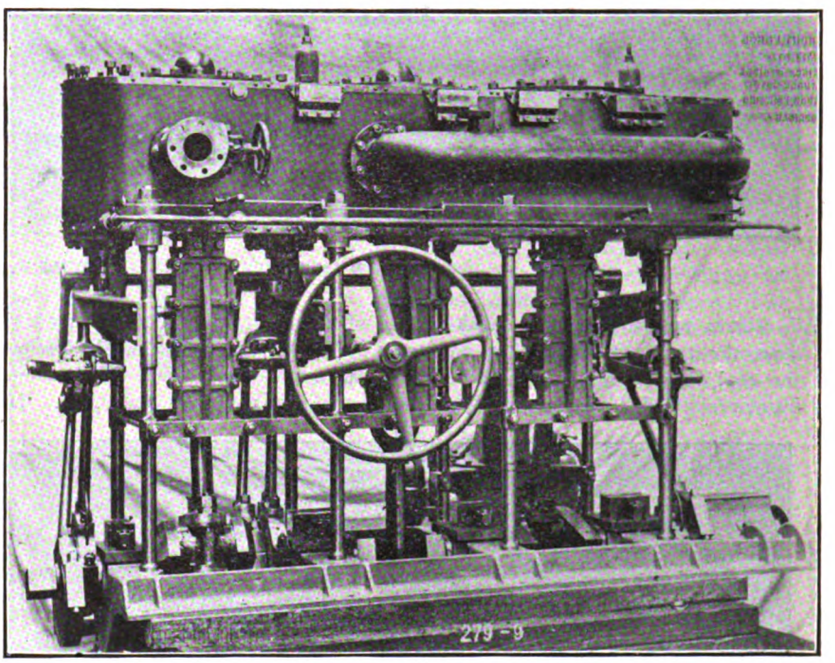
PERSONAL.

Mr. Robert Curr has been appointed by Mr. R. Parry Jones to look after the interests of the underwriters on the City of Cleveland until completed. Mr. Curr will be assisted by Mr. James Thomson, superintendent of the Canadian Ship Building Co. About 400 men are at work rebuilding the vessel. The vessel will be all covered in by Nov. 15 and a system of heating adopted to make it comfortable for workmen on the interior work during the cold weather.

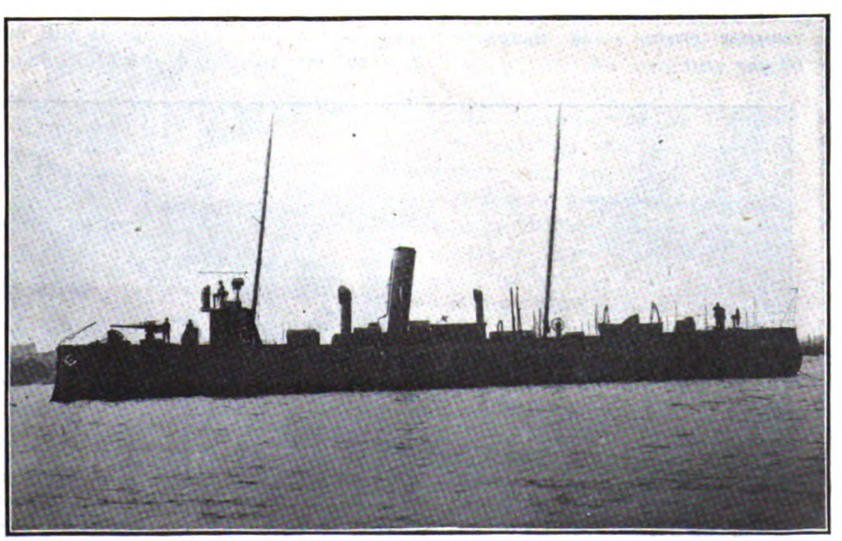
The Parker Hoisting & Machine Co., 971 N. Francisco avenue, has just issued a folder concerning the Hathorne Hard Hitting helve hammer. The folder contains quite a number of testimonials regarding the hammer and also has one page devoted to an illustration of all its parts.

CUSTOMS CRUISER FOR BRAZIL.

Messrs. John I. Thornycroft & Co., Ltd., of Woolston Works, Southampton, have recently built and completed a twin-screw cruiser yacht, named the Amapa, for the customs service of the Brazilian government, and we have been favored by the builders with the accompanying illustrations of the yacht and one of the two sets of engines with which she is propelled. She is constructed of steel to Lloyds 100 A1 class, and on the official trial the Amapa proved herself an excellent seaboat and maintained a speed of 12½ miles with natural draught. This was, it may be added, half a mile in excess of the contract speed. A speed of 15¾ miles was attained with forced draft, this being three-quarters of a mile above the contract speed. Her principal dimensions are: Length between perpendiculars, 130 ft.; beam, molded, 17 ft.; depth, molded to main deck, 9 ft. 9 in. A chart-house with a flying bridge over it is placed at the aft end of the forecastle deck, on which are situated the searchlight, steam steering gear, compass and telegraph. A three-pounder quick-firing gun is mounted on the forecastle head, and a combined steam and hand windlass is also provided. The accommodation for officers and guests is under the raised quarter deck aft, while the petty officers and crew are berthed forward. Stores, fresh water tanks, magazines, and ballast tanks are arranged under the cabin flats. The vessel is lighted throughout by electricity, and fresh air is circulated through the cabins by means of electric centrifugal fans. Three boats are carried. One of these is a 25-ft. lifeboat, another a 25-ft. cutter, and a third a 12-ft. dinghy. Two Downton pumps are fitted for clearing the bilges and for washing deck and fire purposes. The machinery consists of two sets of triple-compound surface-condensing engines working at 300 revolutions per minute, having cylinders of 9 in., 13 in. and 20½ in. diameter, and 11-in. stroke. Steam is supplied from a water-tube boiler working under forced draft on the closed stokehold principle, the working steam pressure being 180 lbs. per square inch.



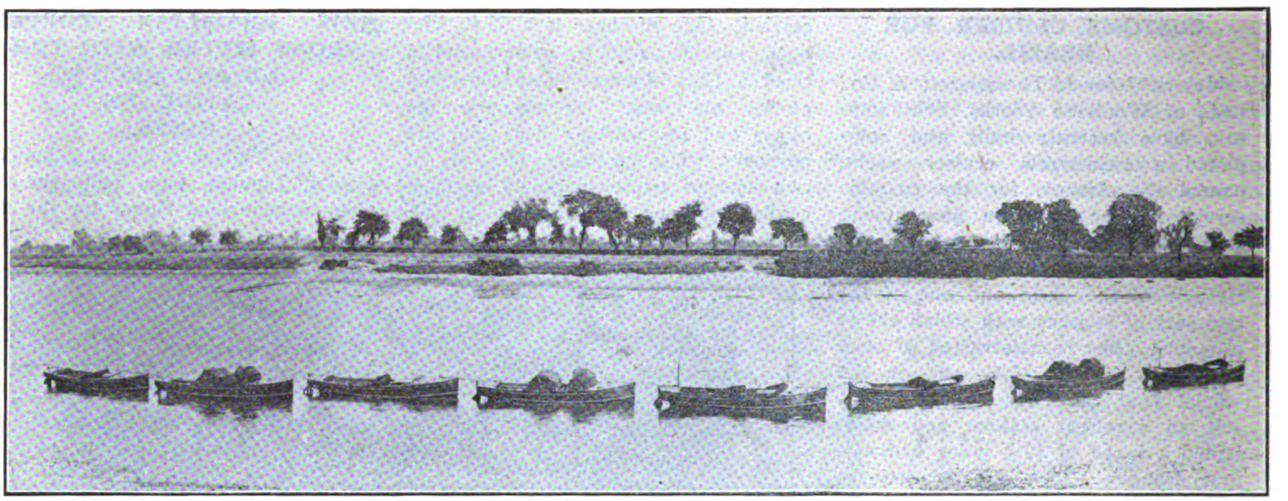
ONE OF THE TWO SETS OF ENGINES OF THE AMAPA.



CRUISER YACHT AMAPA FOR BRAZILIAN CUSTOMS SERVICE.

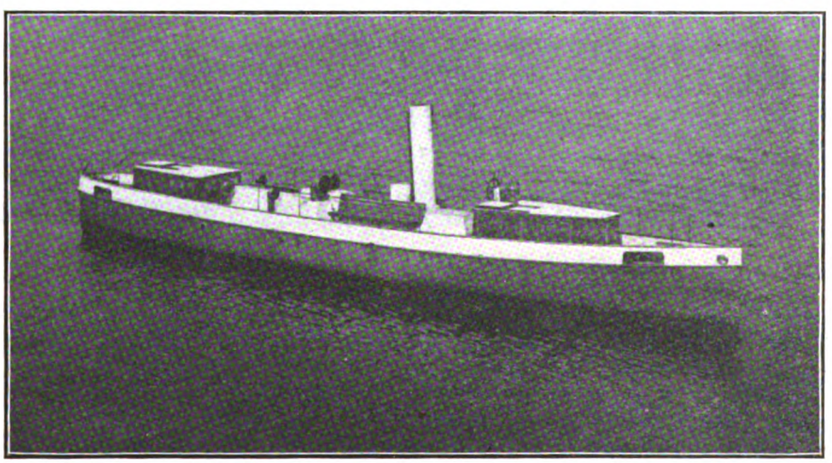
NEW BRAZILIAN TORPEDO BOAT FITTED WITH TURBINE AND RECIPROCATING ENGINES.

Messrs. Yarrow & Co., ship builders, Poplar, London, have built the first class torpedo boat Goyaz for the Brazilian government, which we here illustrate. The vessel is 125 ft. 6 in. in length by 15 ft. 3 in. beam, and has a displacement of about 150 tons in service condition. This type of torpedo boat is similar to those built in recent years by Messrs. Yarrow & Co. for the Austrian, Chilian and Dutch governments. A feature of this vessel is that the engines are both of the turbine and reciprocating type. The reciprocating engine is used for cruising purposes, and is capable of driving the vessel at a speed of 12 knots on a very low coal consumption, in which respect turbines when working far below their full power are uneconomical. When high speeds are required, the turbines are used in conjunction with this engine, which is arranged for the large variation of revolutions necessarily entailed. The turbine machinery consists of one high-pressure and one low-pressure turbine, while the reciprocating engines are of the triple-expansion type. On her official trials and during a three hours' run, the Goyaz averaged 26.493 knots per hour. At a coal consumption trial, a mean speed of 11.277 knots per hour was obtained with 150-



EIGHT MOTOR LAUNCHES FOR TIENTSIN, BUILT BY J. I. THORNYCROFT.

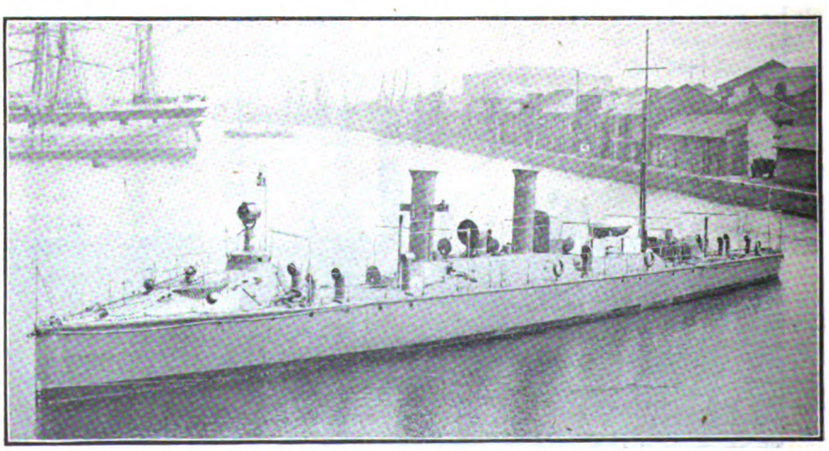
lb. steam pressure in the cruising engine, the turbines being shut off, and the coal consumption under these conditions showed 56 knots run per ton of coal burned. The above figures fully justify Messrs. Yarrow in adopting the combination of reciprocating engines and turbines, in view of the fact that turbines have not yet been found economical at low power, even when a cruising turbine has been fitted. Another difficulty avoided by this system is that of going astern, the reciprocating engine being fitted with reversing gear, as usual, and no astern turbine is in consequence necessary. It may, therefore, be said, that the cruising engine takes the place of a cruising turbine and an astern turbine, and, of course, weighs considerably less. No difficulty is met with in arranging the reciprocating engine to run at the revolutions necessary for full speed, as the slip of the propeller reduces as the speed of the vessel increases, so that, although the speed of the boat increases, say from 11 to 26 knots, the speed of the reciprocating engine only rises from about 340 revolutions to 540 R. P. M. Hence, though the speed is considerably more than doubled, the revolutions of the cruising engine only increase some 60 per cent.



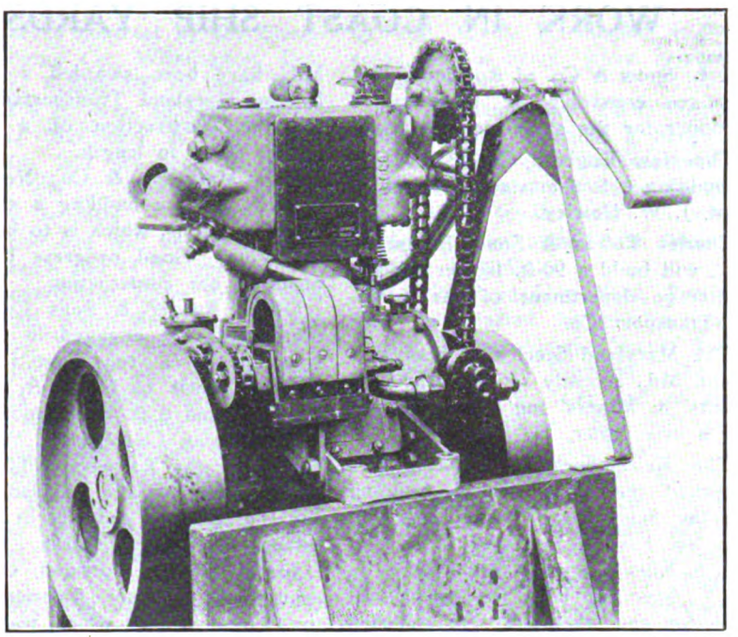
FAST BRONZE DESPATCH BOAT FOR THE BRAZILIAN GOVERNMENT.

DESPATCH VESSEL FOR BRAZILIAN GOVERNMENT BUILT OF BRONZE.

Messrs. Yarrow & Co., London, have built for the Brazilian government a despatch vessel named Guanabara, her principal duties being to carry a rocket life saving outfit, and also to serve as a despatch vessel or government yacht in the Bay of Rio. What is remarkable about this vessel is that she is proof against the corrosive action of the Brazilian waters, which, owing to the great amount of decomposed vegetable matter contained in the water, causes rapid deterioration of thin steel. All the metal work of her hull has therefore been built entirely of bronze, which also gives the vessel a lightness which would be unattainable if built of steel or wood sheated. The propeller shafting and propeller are also of bronze. Although much more costly, both in material and construction, a hull built in this manner will last very much longer than a steel one, while it will not be subject to the depreciation in value



FIRST CLASS TORPEDO BOAT FOR THE BRAZILIAN GOVERNMENT.

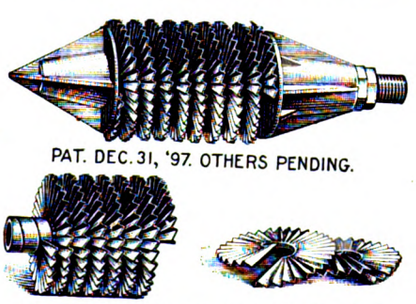


MOTOR FOR LAUNCHES, BUILT BY J. I. THORNYCROFT.

which such a vessel would suffer. The hull externally will not require the protection of anti-fouling compositions, and it is proposed to have it bright and unpainted. The vessel underwent a series of very successful trials at the end of August. She has a length of 60 ft., and attained a speed of 20 statute miles per hour.

COMBINATION FLUE CLEANER.

The Unique Engineering Co., of 100 Hinsdale street, Brooklyn, N. Y., are producing a combination flue cleaner specially built to suit the requirements of the marine engineer and those in charge of marine types of boilers. The inventor of the Unique cleaner, George E. Rothenbucher, is an engineer with some considerable marine experience, and the cleaner



UNIQUE COMBINATION FLUE CLEANER.

has been designed to replace tube scrapers and brushes. The engineer who contends that the hammering of certain types of tube cleaners has a tendency to spring the tubes at the tube plate, causing them to leak and necessitating constant attention, will find in the Unique combination cleaner a device that will remove all scale and grit without detriment to the boiler.

The Unique combination flue cleaner is especially adapted for heavy work, being strongly built and having the only parts subjected to wear and tear renewable. It consists of two cone-shaped end pieces of cast steel between which a heavy brass tube is fitted. On this tube, and in grooves cut thereon, the brush is secured. Each section of this brush consists of a circular sheet of steel cut towards the outer edge into numerous blades. These sections, or discs, are the wearing parts and come in all sizes. One of the cone-shaped pieces has the usual threaded attachment for the cleaning rod.

In removing scale or other deposit from the interior of the tubes the blades of the brush are made to cut away the scale by a rotary movement, though, in the case of tubes wherein the sediment is not very heavy, the cleaner may be handled much the same as any ordinary tube brush. The other cone piece has several perforations towards the tip, and, as the screwed piece can also be used for a steam hose connection, the whole can be used as a steam jet for blowing soot and ashes from the tubes.

The fact that there are over 12,000 of the Unique combination flue cleaners now in use alone speaks for its merits.

The Eureka Packing Co., 48 Warren street, New York, has recently sent out a card to the effect that "Eureka" on packing means the best goods at the least price.

TWO COMPLETE STEERING GEARS.

Editor MARINE REVIEW:—I have read the two letters published in your paper the last two issues on the subject of wheel chains. I have been a subscriber to your paper a good many years, nearly twenty.

I am rather amused at some of the things in both letters. The wheel chains (and the term wheel chains covers the whole steering apparatus) in the modern ship are no more like a few years ago than a trolley car is like an ox cart. Twenty years ago, we steered by hand and I steered some of the biggest of them. If a sea hit your rudder, you lost a spoke or two and sometimes the wheel would get away entirely. Many an arm was broken in this manner. The wheel chains were not subjected to the test they are today. That was a simple proposition. The telemotor is a delicate sensitive instrument. Practically speaking the mate or wheelsman have no more business monkeying with the steering gear than they have to go down and instruct the engineer how to repair his dynamo. I have seen the whole engineering staff of a line send for an expert to make the telemotor go. There are several elements that go to make steering gears inoperative. One is the transmission (no matter what is used, cables, telemotor, etc.) connecting steering wheel with throttle of steering engine; the engine and the chains. The element of crystallization is a factor to be reckoned with and a cause we cannot avoid. No amount of examination by mate, wheelman or the whole crew can discover it. We know when a rope has had considerable hard usage the life is all stretched out of it. We can splice a new strand in a bad place. A chain also loses its life, then breaks, but you cannot see the weakness in a chain. I remember reading the engineer's reason for using cables on the new Williamsburg bridge in New York City, instead of flat bars joined with toggles. Because, like the Brooklyn bridge, the cables could be examined, whereas the toggles were subject to crystallization and the only warning they gave was when they let go. Cable is also subject to crystallization. I have seen steering gear cables broken the same as you would break a dry stick. That is crystallization pure and simple. In the modern ship the mates and wheelsman have so much time in port one of them remarked to me that if he wanted to get a hair cut he would have to lay off a trip. The log, as

required by some of the owners, if kept properly, would necessitate a bookkeeper working about 12 hours a day. Take the steamer Cyprus; the only survivor says he heard the captain remark after talking over the phone with the engineer: "It's all off now." What did he mean? One of three things: First, water in fire hold; second, steering gear; third, main engine. You will note the order I have placed the three possible causes.

The steamer James C. Wallace came into Port Huron last week feebly attempting to steer by the tiller tackles and two tugs. I understand her quadrant was broken. Could the mate in his examination have anticipated this? If we were all blessed with second sight, we might see a small key in a pinion, covered up with a hood to keep the oil in, working out; or a defective casting cracking, or the wheelsman operating his wheel so fast he chokes the cylinders of the steering engine, and numerous other trivial things that puts a steering gear out of business for a short or long time.

I have advocated for seven years two complete steering gears. If I was a word painter I could draw a picture both ludicrous and serious. In 1891 I was second mate of the steamer A. Everett. We were on Lake Superior in quite a gale; our wheel chains parted. We wallowed around for three hours getting the tiller and tackles shipped and rove off, then by use of messengers and snatch blocks we connected to the donkey engine forward of the boiler house. The captain steered (?), the rest of us stood by to help the engine by pulling on whichever tackle was necessary. If there had been a phonograph present to record all the language and a moving picture machine to follow the cook's wife in her racing from the steering engine to the rudder, waving a tablecloth, I believe some of the owners would be convinced it is an utter impossibility to steer a 5,000 or 10,000-ton ship by any other means than a steam steering engine.

To conclude I believe the ships being built now are possitively able and strong enough to weather any blow or sea, but let the steering gear become disabled in a big sea on Lake Superior and any of them would last about as long as the Cyprus did.

Respectfully,

E. C. AKERS.

Port Huron, Mich., Nov. 4.

WORK IN COAST SHIP YARDS

I. L. Snow & Co. of Rockland, Me., are to construct a three-masted schooner for the stone-carrying trade.

The New England Co., Bath, Me., is building a four-masted schooner for Capt. J. W. Hawley.

Charles Rohde & Sons, Baltimore, Md., will build a 90-ft. lighter for the lighterage department of the Atlantic Transport Co.

The Maryland Steel Co., Sparrow's Point, Md., recently repaired the Merchants' & Miners' tug Apollo, giving her a new boiler.

The Kelley-Spear Co., Bath, Me., launched the barge No. 4, building for the Sagadahoc Towing Co., Oct. 26. No. 4 is 150 by 35 by 12 ft.

J. S. Ellis & Sons, Tottenville, S. I., N. Y., have two large tugs under construction and when they are launched two more will be started.

Charles Rohde & Sons, Baltimore, Md., launched an 80-ft. covered lighter for the Tilyard & Watkins Transportation Co. recently.

George A. Cox, Shelburne, Nova Scotia, launched the 250-ton schooner Roseway recently. She is 120 ft. over all, 29½ ft. beam and 12½ ft. deep.

John H. Dialogue & Son, Camden, N. J., will have the 500-ton tug now building there for the McWilliams Co. ready for delivery about Nov. 15.

The Maryland Steel Co., Sparrow's Point, Md., has the Old Bay line steamer Florida well in hand and she will soon be ready to go into commission.

The Marine Railway, Machine & Boiler Works, Baltimore, Md., was the lowest bidder for repairing and docking lightship No. 49, the bid being $1,346.53.

The W. & A. Fletcher Co., Hoboken, N. J., have the hull of the new People's line steamer Princeton at their plant for the installation of machinery.

Wilson Bros., Astoria, Ore., launched the steamer General Washington recently, and she is now at the plant of the Astoria Iron Works receiving her machinery.

A. C. Brown & Sons, Tottenville, S. I., N. Y., have under construction two tugs and an oysterman, and are rebuilding several vessels, among them a freight steamer.

The Mills Ship Yard at Camden, N. J., has been acquired by the Philadelphia Ship Repair Co., and it is to be operated in connection with the Philadelphia plant.

Charles Rohde & Sons, Baltimore, Md., have been awarded a contract by the Maryland Transportation Co., for the construction of a covered lighter 80 ft. in length.

I. J. Matheson & Co., New Glasgow, N. S., are building a steel vessel of 475 tons, which is to be named the Ving. Good progress has been made in her construction.

Oliver Reeder & Sons Co, Baltimore, Md., are engaged in the construction of a tug boat for Capt. Charles Lewis to be 75 ft. long, 18 ft. beam and 8 ft. depth molded.

The Moran Co., Seattle, Wash., has completed the Barneson-Hibbard Co.'s steel whaler and she will sail at once for the whaling grounds at Admiral Island, near Sitka, Alaska.

Joseph Supple, Portland, Ore., will rebuild the steamer America, owned by Captain Good, which was burned at St. Helena in September. It will take two months to do the work.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., launched the steamer George W. Fenwick, building for the Hammond Lumber Co., of New York, Oct. 26.

W. J. Gokey & Co., Erie Basin, Brooklyn, N. Y., are engaged in rebuilding the West Indian wrecking steamer Premier, which is owned by the Merritt & Chapman Wrecking Co.

William E. Woodall & Co., Baltimore, Md., are making alterations to the Baltimore, Chesapeake & Atlantic steamer Old Point Comfort, in order that she may be used for night service.

The Kelley-Spear Co., Bath, Me., was awarded contract for repairing the former lake steamer Lucy Neff, which sprang a leak while en route from Detroit, Mich., to San Francisco, Cal.

The Pusey & Jones Co., Wilmington, Del., installed the machinery in the wrecking steamer Breakwater, built at Milton, Del., for service at the Lewes, Del., breakwater. She is 110 ft. long.

The Moran Co., Seattle, Wash., has launched the steam whaler Tyee, building for the Tyee Whaling Co., of Sitka, Alaska. The Tyee is 110 ft. long, 18 ft. beam and is fitted with 350 H. P. engines.

I. C. Matheson & Co., of New Glasgow, Nova Scotia, are building a steel vessel of about 475 tons, which will be ready for launching early in the new year. She is to be fitted with Oregon pine masts.

William Skinner Ship Building & Dry Dock Co., Baltimore, Md., has

been awarded contract by the Standard Dredging Co., Wilmington, Del., for a coal lighter 100 ft. long, 30 ft. wide and 8 ft. deep, to cost $3,000.

Thomas McCosker & Co., Baltimore, Md., laid the keel for a tug boat for the P. Dougherty Co. of Baltimore recently. The hull is to be of wood and will be 136 ft. long, 25½ ft. beam and 14 ft. depth molded.

The government steam dredge General Abbott, which was recently overhauled by James Shewan & Sons, New York, fitted out at the Pelly Dry Dock preparatory to leaving for her new station at New Orleans, La.

The Bath Iron Works, Bath, Me., has the hull of the turbine steamship Belfast, building for the Eastern Steamship Co., of Boston, 94 per cent completed. This vessel is 335 ft. long.

John Wagstaff, Granville Ferry, N. S., launched the schooner Evelyn for A. D. Mills & Co. Oct. 8. She is 148 ft. over all, 32 ft. beam and 12 ft. depth of hold and is of 286 tons net.

Thomas McCosker & Co., Canton, Md., launched the new tug building for Philip Weaver & Son, Baltimore, recently. The tug, which was christened the Sea King, is 110 ft. long, 23 ft. beam and 11 ft. depth molded.

Moore & Scott, San Francisco, Cal., have been awarded contract for the repairing of the army transport Sherman. The work will constitute a very complete overhauling and will be a task of considerable magnitude.

E. W. Heath, Tacoma, Wash., recently launched the tug Vigilant, for the Ketchikan Power Co. She is 72 ft. long, 18 ft. beam and 8 ft. deep, and will be fitted with the machinery from the old tug of the same name.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., recently repaired the schooner Maggie S. Hart, owned by A. R. Reed, Waldoboro, Me., she having been badly damaged by fire some time ago.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has been awarded contract for effecting the repairs to the Old Bay line steamer Raleigh, made necessary by her recent collision with a tug.

The Frederick A. Vernon Co., West New Brighton, S. I., N. Y., has been awarded the contract for constructing a new ferry boat for the department of charities and corrections of the city of New York, to cost $200,000.

The Harlan & Hollingsworth Corp., Wilmington, Del., has been awarded contract for installing a new heating plant in the steamer Adele, used by Maj. C. A. F. Flagler, engineer corps, U. S. army, when inspecting his district.

The Portland Ship Yard, Portland, Ore., recently launched a barge for the Star Sand Co., and has received a contract from the same company for another similar one. A dipper dredge is also being built there for Nickum & Kelly.

The Portland Ship Yard, Portland, Ore., has started the construction of a new steamer for the Shaver Transportation Co. of Portland. She will be about 160 ft. long and of about 535 gross tonnage. She will probably be known as the Seaver.

Percy & Small, Bath, Me., have been awarded contract for the construction of a six-masted schooner for J. S. Winslow & Co., and which is to be a duplicate of the Edward J. Lawrence, now under construction at that yard.

The Sharptown Marine Railway Co., Sharptown, Md., has completed the rebuilding of the schooner Maggie M. Keough, damaged by stranding on the coast of Florida some months ago. The schooners name has been changed to Howard Compton.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., will repair the tug Gerry, which was run down and sunk by the United Fruit Co.'s steamer Barnstable last August, when five lives were lost. The repairs will take sixty days to effect and will cost $15,500.

E. W. Heath, Tacoma, Wash., has been awarded contract for the construction of a 60-ft. tug for the Merrill & Ring Lumber Co., Ltd., of Seattle, Wash. She will be of 12 ft. 8 in. beam and 5 ft. molded depth and will be fitted with a 65-H. P. gasoline engine.

The Union Iron Works, San Francisco, Cal., will have the American-Hawaiian Steamship Co.'s steamer Isthmian, of 6,000 tons, ready for launching in January. It has not as yet been decided whether she will be fitted with passenger-carrying quarters.

The Bendixsen Ship Building Co., Eureka, Cal., launched the steam schooner Tahoe recently. She is building for the Matthew Turner Co. and is a sister ship to the Hoquiam, built last year. She is 200 ft. long, 39 ft. beam and 15 ft. deep, with a lumber capacity of 900,000 ft.

The Moran Co., Seattle, Wash., will lay the keel for a new passenger steamer for the Port Orchard route, late in December. She will be a steel, oil-burning vessel 180 ft. in length and will have a speed of 18 knots and a capacity of 1,000 passengers.

The Tietjen & Lang Dry Dock Co., Hoboken, N. J., is fitting out the Hogan line steamer Mineola for her much-talked-of yachting cruise. The expense of making the alterations will amount to $30,000 and all the fittings will remain in the vessel when the charterer surrenders her to her owners.

Charles L. Rohde & Sons, Baltimore, Md., recently launched a covered lighter for the Cottman, Adams Co., which was 92 ft. long, 28 ft. beam and 8½ ft. deep. This is the second lighter of this kind built for the same firm for use in Baltimore harbor.

Crawford & Reid, Tacoma, Wash., have been awarded contract for the construction of a gasoline powered tug for the Russian Cement Co. of Anacortes. The tug will be 70 ft. in length and will be powered with a 65-H. P. engine. She will have a large fish tank fitted forward.

The Willamette Iron & Steel Works, Portland, Ore., will install the engines in the steam schooner Capistrano, now building at Gray's Harbor. The steam schooner, Gray's Harbor, owned by the Beadle Bros., has just been fitted with engines at the same plant.

The M. P. Smith & Sons Co., Brooklyn, N. Y., have launched the derrick and wrecking barge Strong Wood. The new vessel is 110 ft. long, 43 ft. wide and 10½ ft. deep and is fitted with an A-frame derrick with a lifting capacity of 75 tons. She also carries fire and wrecking pumps.

Cobb-Butler & Co., Rockland, Me., launched the four-masted schooner Dean E. Brown, Oct. 23. The schooner is for the Benedict-Manson Marine Co., New Haven, Conn., and is 207 ft. over all, with a gross tonnage of 719. She was launched in a completed state, ready to undertake her maiden voyage.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., launched the lumber steamer Nan Smith, Oct. 5. She is building for the C. A. Smith Lumber Co. and is designed for the lumber trade of the Pacific coast. She is 276 ft. long and has a carrying capacity of 2,500,000 ft.

The New York Ship Building Co., Camden, N. J., launched the Columbia River Lightship No. 88, the last of the series of five lightships recently constructed by the government, Oct. 15. The vessel is of steel

throughout and is 135 ft. in length. She will steam to her station off the Columbia river, Oregon.

It is understood that the William Cramp Ship & Engine Building Co., Philadelphia, Pa., has been awarded contract for the construction of two modern steamships of 3,000 tons each for the San Francisco & Portland Steamship Co. They are to be equipped for handling the best passenger traffic.

The new steam schooner Shna Yak, built by the Hill Bros. at Winslow, Wash., has been taken to San Francisco to have her engines installed by the Fulton Iron Works. They will be 13, 21 and 34 by 24 in., with a single boiler of the return-tube type. There will be three corrugated iron furnaces and oil will be used for fuel.

The 72-ton schooner Frances was launched at the yard of Joseph McGill, Shelburne, Nova Scotia, last month. She was built to the order of J. H. Longmire & Sons, Fredericton, New Brunswick, and will be employed in the coasting trade between Bridgetown and St. John, N. B. She is 85 ft. long, 20 ft. 8 in. wide, and 8 ft. deep and is fitted with twin screw gasoline engines.

The Clooney Bros. Construction Co. of Orange, Tex., has been busily engaged in the task of building six barges for the Orange Lumber Co. for its trade on the Sabine river. The same interests are also having built a modern hoisting boat which will be used to raise and transport sunken logs, it being intended to fit the boat with derricks and other accoutrements for this purpose.

The Risdon Iron & Locomotive Works, San Francisco, Cal., has a stern-wheel steamer under construction for the California Powder Co., which is 130 ft. long, 36 ft. wide and 7 ft. deep. She will be fitted with poppet valve engines 18 in. in diameter and with 72-in. stroke. She will be used for transporting powder and other explosives from the plant at Pinole, Cal., to San Francisco and Oakland.

The Union Iron Works, San Francisco, Cal., will soon have ready for launching the largest steel self-propelled oil barge in existence. She is over 200 ft. long and will be driven by twin screws, with gas engines for power. There are two main engines of 300 H. P. each and a 100-H. P. gas engine for driving pumps and discharging cargo. The engines were built by the Union Gas Engine Co.

The William Cramp & Son Ship & Engine Bldg. Co., Philadelphia, Pa., launched the sidewheel steamer Commonwealth Oct. 9. She is building for the New England Steamship Co. and is 456 ft. long, 96 ft. in width from guard to guard and draws 22 ft. of water. She is equipped with the most modern machinery of the side-wheel type and is the largest and most luxuriously furnished steamboat of her kind in the world.

The Wallace Ship Yards, Vancouver, B. C., are preparing to erect ship building ways with a capacity of 2,500 tons, and with machine shops attached, at North Vancouver, B. C., which will be ready for service early in the new year. The plans and specifications for the plant will be prepared by H. J. Crandall & Sons, of Boston, who are well-known specialists in this kind of construction. The actual work of erection will be done by the Wallace Ship Yards Co.

The Moran Co., Seattle, Wash., is to rebuild the steamship State of California, owned by the Pacific Coast Steamship Co., San Francisco, the alterations being so extensive that it is estimated that it will take five months to make them and that the steamer will be practically a new vessel upon their completion. New decks will be laid and the houses will probably be entirely rebuilt. New boilers will be installed and the machinery given a thorough overhauling.

The Sharptown Marine Railway Co., Sharptown, Md., has laid the keel for a large coasting barge which is to be built to the order of John T. Donohue & Co. of Baltimore, and which is to be almost an exact duplicate of the barge now under construction at that yard for the P. Dougherty Co. of Baltimore. The keel is 200 ft. in length and the beam is to be 35 ft. She will carry about 200 tons and is to be completed by March 1, 1908.

The Maryland Steel Co., Sparrows Point, Md., has recently been awarded contracts for two steel seagoing dredges for use in New York harbor, as well as three steel "knock-down" barges for the Isthmian canal commission. The dredges will be 290 ft. long, 47½ ft. beam and 28 ft. deep, to be of the self-propelling type, with four Scotch boilers. The barges are to be 123½ ft. long by 31½ ft. beam by 10½ ft. deep, and are to be used as auxiliaries to the dipper dredges.

Mr. R. P. Schwerin, general manager of the Pacific Mail Steamship Co., is at present in the east arranging for the building of two new steamers for the company's trade between San Francisco and Portland. Mr. George W. Dickey, consulting naval architect for the Pacific Coast Steamship Co. is preparing plans for the construction of an express passenger steamer for the company. The preliminary plans call for a steamer 400 ft. long to be equipped with turbine engines. The New York Ship Building Co., Camden, N. J., recently built the President and Governor for the Pacific Coast Steamship Co.

J. Lindstrom, Aberdeen, Wash., launched the steamer Clermont, building for the Hart-Wood Mill Co., Aberdeen, Oct. 19. In leaving the launching slip the Clermont went clear across the harbor and onto the soft mud, from which it required a good deal of pulling to release her. No damage was done. The steamer is 203 ft. over all, 28 ft. beam and 13½ ft. depth of hold. She will be fitted with her machinery at San Francisco. The Clermont is a sister ship of the Saginaw, launched a short time ago at Hoquiam, Wash.

There are under construction at the ship yards of Bath, Me., 13 vessels, as follows: Bath Iron Works, scout ship Chester for the U. S. navy, two torpedo boat destroyers, also for the government, and the turbine steamship Belfast. All these vessels are of steel construction. At Percy & Small's there are a five and a six-master building. At the New England Co's yard there are three four-masters. At Gardner G. Deering's yard, one four-master. At the yard of Frank S. Bowker, one three-master, and at the Kelley-Spear Co.'s yard, two barges.

Secretary of the Navy Metcalf recently paid his first visit to New York navy yard since he became the head of the department, his visit being made to investigate the delay in the construction of new dry dock No. 4, which has been brought about by the failure of the contractor to continue his work under the contract, alleging unforeseen difficulties due to a fault in the construction of a municipal sewer, and which he claims were not properly charted on the government map, have made it impossible for him to complete the work except at great financial loss to himself. A surety company which signed the contractor's bond has denied the liability because of the conditions which have been encountered, and Secretary Metcalf is anxious to get the affair straightened out so that the dock can be completed without delay.

A pile driver at New Orleans is 108 ft. high; supposed to be the highest ever built.

VENTILATION AND REFRIGERATION OF AMMUNITION-HOLDS.*

BY ADRIEN BOCHET.

The safety of ammunition holds has always engaged the attention of naval architects, and for many years past measures have been taken for isolating these holds, for protecting them against the various causes which may lead to an accident, and for inundating them in the event of danger. Modern powders, and the considerable development in the use of machinery on board ship, have increased the risks in a large proportion. Modern powders have excellent ballistic properties, but are also most unstable, and their instability increases very rapidly with an increase in temperature. By their gradual alteration they also set free a quantity of inflammable gases which may give rise to explosive mixtures. The development in engines and boilers, in auxiliary engines, and in the extent of steam pipes laid throughout the ship, has led to a greater heating of the various compartments. The distribution of the armament, and the necessity of providing ammunition holds in proximity to the guns to be served, have often resulted in the holds being in locations that are particularly unsuitable from the point of view of temperature. Therefore, concurrently with a gradual increase in sensibility to heat, which forms one of the characteristics of modern powders, causes tending to augment the temperature of the ammunition have increased in a large proportion also, and numerous attempts have been made with a view to ensure the artificial refrigeration of the holds.

Cooling by ventilation alone is a simple and safe means to prevent the accumulation of explosive gases, but is quite insufficient to ensure a decrease in the temperature of the holds when the temperature of the air outside reaches 20 degrees (say 70 degrees Fahr.), and when the causes making for an increase of temperature in the holds attain a certain importance. The heating of the air which enters the ship occurs rapidly on contact with the warm bulkheads, by reason of its low specific heat. A rise of 10 degrees Cent. has often been noted for courses which appeared as short and direct as possible between the upper works of the ship and the fans placed in the holds. Cooling by the means resorted to in refrigeration holds, such as those for the transport of meat, appeared at first to constitute a final solution of the problem. But this failed completely, owing to the very great difference existing between these holds and those for storing ammunition. In the former there is no ventilation, and they remain closed during the whole passage. They are also maintained at a very low temperature, and one result of this is that the small proportion of moisture contained in the local air on starting gets deposited on the products contained in the refrigerating chamber, and does not injure them in any way. Ammunition holds, on the other hand, require ventilating. Even were one so imprudent as to do away with ventilation completely, or to reduce it in too large a measure, the requirements of the service would demand the frequent opening of the hold, thus allowing every time the outside air to penetrate into it. Finally, the temperature which it is suitable to maintain in an ammunition hold is much above 0 Cent. (32 degrees Fahr.). One result of this frequent renewal of the air in an ammunition hold is that the moisture it contains is condensed on all the surfaces which are maintained at a lower degree of temperature than that of the outside air, and the water which cannot be congealed, as in the case of a provision hold, trickles down the partitions of the holds and the ammunition. This very grave disadvantage can only be avoided by cooling the air entering the ammunition hold, so that it is not at a higher temperature than that of the contents or of the walls of the hold.

The only rational means to cool ammunition holds is to ventilate them with air suitably cooled, and this deduction has received the sanction of actual practice, as it is the only method of cooling which has prevailed so far. It has been applied to 14 French battleships, which carry together 43 ammunition hold cooling plants, and to eight Russian battleships, which are fitted with 37 similar plants. It will be fitted also to the armored cruisers Waldeck-Rousseau and Michelet, now in course of construction. The ammunition holds of these two ships are to be provided with aero refrigerators, in which a circulation of artificially-cooled liquid is maintained constant; the dynamo rooms are to be cooled by a similar installation, but with sea-water circulation.

Until recently, the maximum temperature which was thought advisable for ammunition holds was 35 degrees Cent. (95 degrees Fahr.); now, however, this limit has been brought down to 30 degrees Cent. (86 degrees Fahr.). With the former limit direct cooling by sea-water circulation sufficed, as the temperature of the water taken from a certain depth remained perceptibly lower than 35 degrees Cent. in all parts of the world. The latter limit, however, can only be reached by having recourse to artificial refrigeration.

The refrigerators for cooling the air consist of metallic surfaces, on one side of which the cooling liquid circulates, the air to be cooled circulating on the opposite side. A pump ensures the circulation of the liquid, and a fan that of the air. The complete apparatus are built by F. Fouche, 38, Rue des Ecluses St. Martin, Paris.

The extent to which refrigeration has to be carried depends upon the amount of heat which enters the hold: it is necessary, in the first place, to reduce to the lowest possible minimum this amount of heat. The afflux of heat in the hold is caused by radiation from the warm sides and by conductivity from the metallic pieces they contain, and which are connected to the heated sections of the ship. The methods of obaining a thermic insulation of the hold are the following: Radiation from the warm sides can be reduced by an inside lining made of substances the conductive and emissive properties of which are low, such as cork and asbestos. Another solution is to build a double wall, to obtain an air lining, in which case it is advantageous to ensure in the double wall a circulation of air at the lowest possible temperature. The circulation of a cold liquid inside the double wall will give most satisfactory results, provided the liquid be brought sufficiently in contact with all the metallic pieces that are liable to carry heat into the hold by conductivity.

It is easy in principle to ensure the thermic insulation of the hold, but in actual practice the application of the various methods is surrounded with great difficulties, owing to the arrangement of the holds, the small space available, and the necessity of preventing every cause of damage to the ammunition. The use of simple insulating inside coverings of a thickness proportional to the heating of the walls and the available space is evidently the most easy solution of the problem. As this method has hitherto proved of sufficient efficiency, it has alone been developed in actual practice. The use of double walls with air circulation has, however, been successfully combined with the insulation of the sides.

The use of a cold liquid screen is surrounded by the following difficulties: In order to be efficient, there should be no break or interval in the current. It should reach the whole of the metallic pieces which are liable to cause heat in the hold by conductivity. All risks of inundating the hold in case of leakages have to be removed. The cold screen is constituted by a double wall, but it is absolutely impossible to give the space sufficient dimensions to allow a men to enter it in order to paint the plates and keep them

*Translation of abstract of paper read at the Bordeaux International Congress in Naval Architecture.

in a good state of repair; this proscribing the use of all liquids, such as sea water, which may corrode the plates. The solution consists in causing to circulate inside the double wall a liquid, such as fresh water charged with oil, or milk of lime, with which there is no risk of corrosion. The total quantity of liquid thus circulating has to be as low as possible, so as to prevent in any case the risk of inundation of the hold. If a leak did occur, a small quantity of liquid only would escape without risk of damaging the ammunition. Simple means suffice to show when an accident of this kind has happened.

The paper was accompanied by drawings showing how a hold could be insulated and the method followed for ventilating it with cooled air. The combustion is such that the injected air cannot be hotter than the sides of the hold, which prevents all deposition of moisture. The insulation of the hold is completed by the flowing of the exhausted air round the walls. The liquid and the air for ventilation can be cooled simply by sea water or by means of a refrigerating machine, according to the temperature required to be maintained in the hold.

The amount of heat Q^1 penetrating through the walls is proportional to their surface $\int s$, to the difference of temperature between the two sides $T - t$, and to the time.

The number of heat units going through a given partition per unit of surface and time q^1, for one degree difference in temperature, is determined experimentally. Numerous tests have established the figures corresponding to partitions covered with the usual insulating material. The following formula is obtained:

$$Q^1 = \int s\,(T = t), q^1$$

for the unit of time.

Further, the metallic parts, such as partitions, bulbs, standards, projectile supports riveted to a warm wall, cause a quantity of heat to penetrate the hold; this is

$$Q^2 = \int s \frac{q^2}{e}\,(T - t),$$

where s is the section of the metallic part considered; e the distance between the point where the heat maintained at temperature T penetrates, and the point whence this heat is emitted inside the hold, the temperature of which it t; q^2 being the number of heat units passing per unit of time and per unit of section of the piece, considered between two points, with the unit of length between them, and maintained at a temperature difference of one degree.

Neglecting the amount of heat brought in by the *personnel,* caused by the handling of the projectiles, also the entrance of warm air, the total quantity of heat penetrating the hold will be

$$Q = Q^1 + Q^2.$$

This amount of heat has to be totally carried away by ventilation in order that the hold may be maintained at the required temperature. It is necessary, therefore, to send into the hold a volume of air V capable of absorbing the quantity of heat Q, by being heated from its entrance temperature τ to an outlet temperature θ. The calorific capacity of air being 0.3 heat unit per cubic meter, the following will be the formula:

$$V = \frac{Q}{0.3\,(\theta - \tau)}.$$

It is necessary to ascertain that the volume of air thus determined meets the ventilating conditions of the hold according to the nature of ammunition it contains.

In order to bring the volume of air V from the initial temperature Θ measured at the moment it enters the refrigerating machine to the temperature θ measured at the outlet, the amount of heat given up by the air proper, by the water vapor it will contain after cooling, and that given up by the vapor which condenses, have to be deducted.

The specific heat of dry air being 0.3 heat unit (calorie) per cubic meter.

That of vapor being 0.48 heat unit (calorie) per kilogram,

The latent heat of water evaporation being 606.5 heat units (calories) per kilogram,

p the weight of water vapor contained in one cubic meter of air drawn, and

p^1 that remaining in one cubic meter of the air after cooling,

The formula for the heat to be absorbed will be

$$Q^1 = V\,[\Theta - \theta)\,(0.3 + 0.48p^1) + 606.7\,(p - p^1)].$$

In designing the refrigerating machine it is necessary to add to this amount of heat Q^1 that resulting from the heating of the apparatus themselves, and of the pipes in which cold air and liquid circulate.

The dimensions of the apparatus and of its auxiliary parts—the circulation pump and the fan—are deduced from the volume of air V flowing per unit of time, and from that of the cold liquid necessary to carry away the quantity of heat Q^1 increased as aforesaid.

It should be remarked that the power of transmission of heat of an aero-refrigerator from air to water is, so to speak, without limits; it depends solely upon the output. It increases with the speed, so that the dimensions of the apparatus, suitably proportioned, are solely dependent upon the required pressure of the air and the cooling liquid.

Observations made on a number of installations show that the machines supply air easily at a temperature which does not exceed by much more than about 1 degree Cent. that of the cooling liquid, whatever be the temperature of the air drawn into the machine. The water-vapor contained in the air is completely condensed in the aero-refrigerator in a proportion which corresponds with the fall in temperature. The hold thus remains perfectly dry.

Tests made on board the Sully, in the Far East, have shown that with temperatures of 31 degrees Cent. (87.8 degrees Fahr.) for sea water, and 36 degrees Cent. (96.8 degrees Fahr.) for the air, the apparatus maintained the hold at a temperature of 32 to 34 degrees Cent. (89.6 to 93.2 degrees Fahr.).

The results of other tests, and illustrations of the apparatus, were given in the paper.

KNOT OR NAUTICAL MILE.

Editor MARINE REVIEW:—I notice in your answer to "Mariner's" query on "knots per hour" in the issue of Oct. 31 that "the prevailing idea is that knot and nautical mile are one and the same thing, and the word knot is used to prevent any possible confusion with the statute or land mile."

Though every seafarer knows that a knot or nautical mile equals 6,080 ft., it is surprising how few can tell offhand where the measurement was derived from. In the Bird-Archer book we read that "6,080 ft. is the length of one minute of longitude measured on the equator, or, $= \frac{1}{60 \times 360}$ part of the equatorial circumference of the earth."

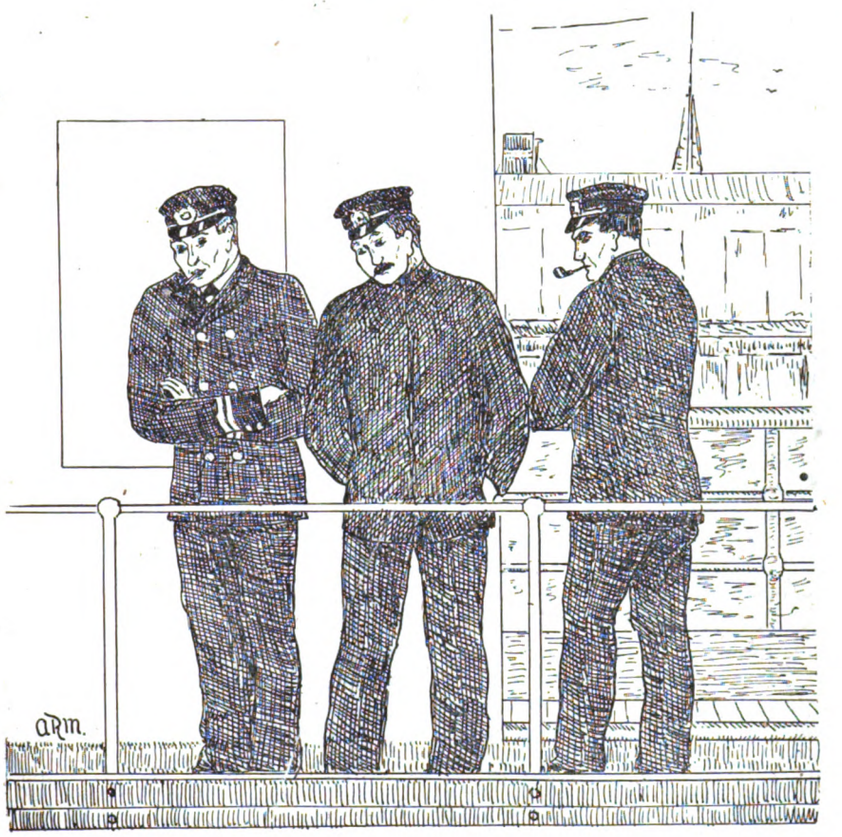
New Jersey, Nov. 2. ENGINEER.

The Bird-Archer book referred to in Engineer's letter is the treatise on Marine Boiler Deterioration issued free on request by the Bird-Archer Co., of New York. The book also contains much useful information, tables and formulae.—EDITOR.

Captain H. H. Parsons, steamer J. H. Sheadle: I can say this for it: After a careful study of the Course Finder, in my opinion it is by far the most valuable article ever published for the benefit of the ship master on the lakes, and it is something, I believe, no master will care to be without once he knows what the book contains.

"IN THE MERCHANT SERVICE"

Fresh from the ship yard, the latest addition to the fleet was lying at her berth across the dock, and some of the engineers of the old Alroma had gone over to have a look at the new machinery. They had gently refused the assistance of the new ship's First, who was making preparations for spending the evening ashore, preferring to have a look around at their own sweet will.



THEY HAD BEEN OVER TO SEE THE NEW MACHINERY.

It is hardly proper courtesy to point out a ship's faults to one of her engineers—especially as he is probably well aware of them—and it is usually the faults that such self-appointed committees of inspection endeavor to dig up. But that was not their only reason for refusing the pilot. They knew that the First had in bringing the ship round from the yard (with all its attendant worries) probably seen enough of his "job" to last him a little while, and was glad to escape to parts where strange unexpected noises with the accompanying hurried inquiries for the First could be heard not.

On their return to the Alroma they aired their views to those who had remained behind and re-discussed the points discussed across the dock. They found fault with the location of the pumps and decided that they were "cramped." The feed check valves also came under their condemnation, and, "would be mighty hard to get at if a joint should happen to blow out." Someone didn't think she had enough of head room on her middle platform, and an unnecessary amount below, and, in fact, could have done with her grating about a foot lower. There were several other features not in keeping with their views of how an engine and boiler room should be designed, and they discussed them all.

"Well," ventured a junior making his maiden trip, "it seems funny to me that, if the ship has all the faults in her machinery you fellows mention, the engines can't be designed to rectify these mistakes. I should think that the men who design the general layout of the machinery ought to know something of the practical end. Why, when Brown and I were fixing that joint in the donkey house at sea, I recollect Brown saying that the man who designed the pipe line ought to be made to eat it." "Yes," said Brown, "that's right about that pipe line, and it is only one instance. Take as another, our smoke-box doors. I've been on ships where the door was in two sections, with a small door held by two catches at the bottom, the catches being attached to the casing. To clean the box, all that was necessary was for the fireman to knock out the two catches, rake out the ashes, and push the door up with one hand while he knocks the catches on with the other. One man—one job—one minute. Here, you muster all the spare men with every available fire tool. You knock up all the catches, which are attached to the door, but one. Probably when you knock up the last catch the vibration causes one or two of the others to fall back and lock. Eventually you somehow get the door open and the ashes pulled out—and the real trouble starts. You line up the men on an average of one man to each catch, carefully raise the catches ready to fall into position, and, with one combined effort, slam the door to. Of course, the first few times you will find that a catch has fallen a fraction of a second too soon, and you make numerous fresh starts. The air is thick with fire tools, dust and language. Eventually you get the door closed and catches right, and find that the steam has dropped a pound or two. One job—six men—six minutes."

"Yes," remarked the third, "and you neglected to mention that the men who are supposed to be firing have eased up temporarily to watch the fun and admire your flow of epithets. Look at the many systems there are of getting ashes from the boiler rooms overboard and how many could do with considerable improving. The last old hooker I was on had the usual winch attachment on the main deck, the ashes being heaved up through the ventilator. The skipper sent down word one night that the passengers objected to the coal passer's signal to heave up—the signal consisting of a portion of slice bar being brought in violent contact with the lower end of the ventilator—and advised the passing of the word. As was to be expected, this plan didn't work altogether satisfactory. It is out of the question to ask a coal passer to call gently up a 50-foot ventilator, so the next night or two the passengers had to listen to the

signals—and occasional snatches of conversation more forcible than polite—being passed through the ventilator in yells that would have been creditable work for a band of Sioux. We tried various methods of remedying the evil, but when I left the ship they had gone back to the old original."

"Talking about winches and ventilators comes pretty close to reminding me of a system I had some dealings with," said the second. "The ship in question had special tubes for hoisting ashes through, a good-sized iron bucket taking the place of the usual bag. It was a splendid arrangement in fine weather, but, when the old packet rolled or had a list, it was a bird. You see, the foot of the tube or chute was about ten feet from the floor plates, so, when a bucket started to travel up with the ship keeled over, it would swing around till it struck the base of the chute, when it usually spilled half of the contents on the men below. The tube was a pretty close fit on the bucket, too, which didn't help matters any."

"How many ships are there," demanded the aggrieved Brown, "that have their checks easy to manipulate or overhaul? How many are there that have their bilge and tank pipe lines laid so that a man can form an idea where a pipe is coming from or going to, without tearing up the whole darned floor? How many are there with a decently located mud boxes and strainers? Darned few!"

"Old Brown's death on the pipe line designer," commented the third; "but, after all, straggling pipe lines are not the worst of our troubles."

"But what I would like to know," pursued the inquiring junior, "is—if these faults are repeated as new ships come out, why cannot some one point them out to the proper parties? They could easily be arranged properly without any extra trouble, we engineers would be spared a lot of exertion, and everybody would be satisfied. Why has it never been looked into? That is the question—that's it."

They all gazed long and solemnly at the junior, nooded their heads profoundly, and spoke.

"That's it," they chorused, "ah—that it's it."

THE "STAND-BY" MAN.

The government has abandoned operations on the tug Kate Williams ashore at Jackson Harbor. If the tug survives the winter storms, another attempt to release her will be made in the spring.

NOTES AND COMMENTS.

The annual fish catch of England is valued at $53,960,000.

About 1,200,000 people are always afloat on the seas of the world.

Radium is still selling pretty high. If anyone had a pound of it, it would be worth about $900,000.

In the seven seas, about 160 whales are captured yearly. Each whale averages about 2,000 gallons of oil.

Japan is now threatening the red herring industry of Scotland. A group of Japs have been spending some time in Shetland studying the business of fishing and curing as carried on there.

The United States government has contracted with Glasgow ship brokers to convey 200,000 tons of coal to the Pacific for the use of the American fleet. Twenty-one Glasgow steamships have been chartered.

At the last distribution of awards for bravery by the Carnegie Hero Fund Commission, a bronze medal was presented to William J. Breen, marine engineer of New York—for saving the life of Christopher Powers, a sailor, on May 16, 1906.

The trawler Helvetia put into Grimsby, England, recently with what is described as the finest catch of sturgeon ever landed at any market. One of the fish measured over ten feet and weighed 210 pounds. The catch of 65 fish realized $655, the largest fish bringing $50.

For his care of 2,800 Russian soldiers and their officers on a voyage last June from Vladivostock to Odessa, Capt. Mark Campbell, commander of the Afghan Prince, has received a gold watch and chain as a reward from the Tsar of Russia. The presentation was made by the Russian consul at Newcastle-on-Tyne.

The enlisted men of the North Atlantic fleet will present a handsome loving cup to Miss Helen M. Gould in the near future. Miss Gould has endeared herself to the men of the navy by her philanthropic work for their interest, and especially by providing the magnificent naval branch of the Y. M. C. A. on Sands street, Brooklyn. The presentation will be at Carnegie hall.

The enlisted men of the battleship Connecticut recently gave their annual dinner and ball at Stauch's Pavilion, Coney Island, when 2,000 men, officers and guests were present. The grand march was led by Capt. Osterhaus of the Connecticut, and Mrs. Osterhaus. At midnight a dinner was served at which 1,826 people sat down. The affair was one grand success.

There are no fewer than 49 clocks on the Cunarder Lusitania. But the confusion which would result if their hands were uncontrolled is, according to the "Jewelers' Register," avoided by the presence of a master clock in the charthouse. As the vessel goes west all the clocks can be stopped for 20 minutes at a time. To put them back would, of course, be undesirable. The hands can also be simultaneously moved forward.

The French submarine boat Lutin, which sank with all hands at Bizerta in October, 1906, had another accident on October 29, and went to the bottom a second time. The Lutin was recently raised and brought into Toulon to be refitted. In the harbor, while at anchor, a steam ferryboat struck her, smashing her bows in. No lives, however, were lost on this second occasion.

At the opening session of the new motorboat school of the West Side Young Men's Christian Association, New York, Lewis Nixon delivered the address. He said that gasoline power for boats, including warships, would eventually succeed steam power, on account of its simplicity and the great saving in labor that would result from its use. He also said that there are about 25,000 gas engines in use in the United States and about 5,000 in Holland, many of them freighters.

This is the second gold watch received by Captain Campbell from crowned heads. Emperor William, of Germany, gave him a gold watch bearing his likeness and the royal monogram in December, 1889, for his bravery in rescuing the captain and crew of the Sirius, a German brig, which he found dismantled two hundred miles off Cape Hatteras, after a hurricane. As several members of the crew were Danes, the king of Denmark, also presented a gold medal to the captain.

The foreign export trade of Boston and Portland is expected to show a gradual increase in the next few months, as a large amount of western produce passes through New England on its way to Europe each fall and winter. The grain traffic at Boston has been handicapped during the last year or two, but as wheat is now in great demand abroad, due to short crops, increased shipments are expected. As a result of increase in grain exports all the steamship lines have advanced their rates on future bookings. The grain rate to Liverpool has jumped from four to five cents for December and January loading, and to London it has jumped from five to six cents. On all other commodities rates have advanced.

ATLANTIC COAST GOSSIP

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The new Italian liner San Giovanni has arrived at New York, after making good time from Palermo and Almeria.

The San Giovanni was built at Sunderland by Sir James Laing & Sons, Ltd., and is 425 ft. in length, 52 ft. molded beam, and 27 ft. 10½ in. in depth. She has two sets of triple expansion engines, with cylinders 24 in., 39 in., and 64 in. in diameter by 45 in. stroke. The engines were built by Messrs. Geo. Clarke, Ltd., and drive the steamer at an average speed of 16 knots. She has accommodation for over 2,000 passengers.

The American liner Friesland will be placed in the Red Star Line service between New York and Antwerp, in the place of the damaged Finland, which collided with Dover breakwater and is now undergoing repairs.

The Friesland was formerly in this service, and was a favorite with regular trans-Atlantic passengers. Of late years she has been in service between Philadelphia and Liverpool.

The steamship Saratoga arrived at New York last week and reported colliding with an unknown schooner early Tuesday morning. The Saratoga was not damaged, and it is believed by her officers that the schooner escaped with nothing more serious than some injury to her headgear.

Postmaster General Meyer has received advices from the postoffice department of Italy that the recent order of that government by which mails for the United States were to be sent exclusively from Italian ports and in Italian ships, had been rescinded on Oct. 18, and that such mails would thereafter be forwarded by way of French ports, as formerly.

The American consul-general at Christiania, Norway, has reported to the bureau of manufactures the establishment of a line of steamers between Christiania and ports on the Gulf of Mexico. Grimsby, England, is a port of call, and the destinations are Havana, Vera Cruz, Mexico, and Galveston, Tex. This new line will be direct, whereas all previous steamers went by way of German ports.

The new line is subsidized by the Norwegian government, service being maintained monthly. If sufficient freight can be obtained the company is prepared to establish a fortnightly service.

Bar and coin gold to the value of $10,000,000 is being brought to the United States on the Cunard liner Lusitania, which left Liverpool for New York last Saturday.

Officials of the North German Lloyd Steamship Co. have announced that the Kaiser Wilhelm der Grosse, which lost her rudder on her last eastbound trip, has been more seriously injured than was at first believed. An entirely new rudder and stern post will have to be fitted, work which cannot be completed before next March.

The government vacated the old custom house of New York, at Wall and William streets, on Saturday, and have now taken possession of the new $5,000,000 edifice at Bowling Green. The old building becomes the property of the National City Bank.

Henry C. Stuart, acting deputy collector, was in charge of the transfer, all official documents, and records covering the history of the port from 1799, when the grst custom house was erected on the site of teh new building, being conveyed to the new premises.

The submarine boat Tarantula, which is undergoing her final acceptance trials under the direction of the naval board of inspection and survey, exceeded her contract speed requirement in a four hours endurance run in Narragansett Bay last week. In spite of a stiff wind and choppy sea the boat developed a speed of 9.4 knots, the contract calling for 8.75.

The postmaster-general on Nov. 1 executed contracts with the American Mail Steamship Co. for the transportation of mails between Boston and Philadelphia and other ports of the United States, and between American ports and Jamaica for a period of 10 years from July 1 next. Contracts were also made effective on the same date with the New York and Cuba Mail Steamship Co. for carrying the mails between New York and Havana.

The Cunard liner Saxonia, which sailed from Boston recently, carried 15,000 barrels of apples for Liverpool, the largest shipment of apples ever carried from that port. The apple export business has increased, and other big shipments are to follow.

A stowaway nearly lost his life in the bunkers of the steamer Umvoti, which has arrived at New York from the Persian Gulf. His presence was discovered by a fireman, and 185 tons of coal were shifted before the man, who was an Egyptian, was rescued. The immigration inspectors say that he will be deported.

Booth & Co., agents, announce the inauguration of a direct steamship service between New York and Iquitos, Peru, by the Iquitos Steamship Co., Ltd. It is expected to maintain a regular service with sailings from New York every 40 to 45 days, two vessels being engaged.

This is the first direct service to be established between New York and Iquitos, which is 1,960 miles from the mouth of the Amazon river and 4,940 miles from New York. Heretofore the New York shipments for the great rubber districts have been transferred to lighters at Manaos, Brazil, and towed to their destination.

Booth & Co. also announce that the freight tariffs have been revised so that American shippers will enjoy exactly the same rate as English and European shippers.

LEAVING NEW YORK AT NIGHT.

A fairy web hangs glittering in the sky
Behind us and a million lights aglow
Cast dancing shadows on the ebb and flow
Of lapping waters that steal softly by,
Over the waves the winds unceasing ply,
And murky clouds across the moon's face blow,
Great silvery patches in the heavens grow,
And then the winds in utter darkness sigh.

But we speed onward swiftly from the shore,
And hear the muffled engines underneath
That throb and pulse in patient slavery,
Soon shall we be where wilder waters roar,
Where round our battered bows the oceans seethe,
Soon peer into unfathomable sea.

M. J. H. in *N. Y. Times.*

C. W. Elphicke, of Chicago, has been selected by the owners of the steamer Chili as permanent managing owner of the steamer to succeed the late Capt. M. M. Drake, of Buffalo.

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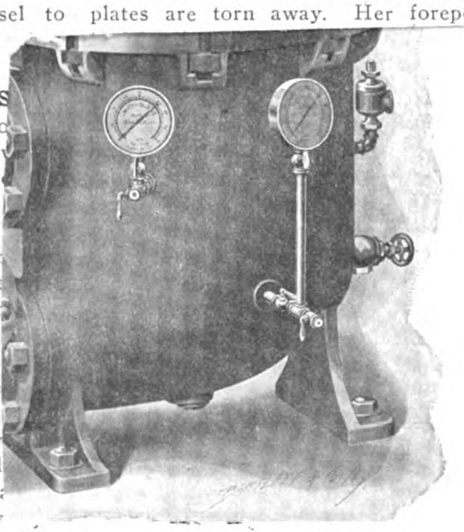
USE OF OIL IN STORMS.

The use of oil on water does not appear to be appreciated as greatly as it should, though its efficacy has been known since biblical times. The hydrographic office has issued a monograph on the subject and it would be well for every vessel owner to obtain copies of it for distribution among his masters. Recently the Kaiser Wilhelm der Grosse, one of the finest steamships in the world, lost her rudder during a gale which rapidly developed into a hurricane, making a heavy and dangerous sea. The captain poured oil on the water, forming a coating over the rollers which prevented their breaking over the vessel and enabled him to steer her with her propellers. Capt. H. H. Parsons, of the steamer Sheadle, recently made the remark that he believed the Mataafa, or at least her crew, could

have been saved if a barrel or two of oil had been poured into the Duluth ship canal and permitted to distribute itself over the surface of the water. But nobody thought of it. It would be well for every vessel to carry a quantity of storm oil.

IRON ORE SHIPMENTS

The October movement of c... certainly surprising, as it comes ... 324,156 tons of equaling the r... breaking month of the present ... During October 6,482,654 tons ... moved, as against 6,806,810 to... August, last. The total moveme... to Nov. 1 is 37,041,861 tons, wh... only 471,728 tons below the ... movement for the whole seas... 1906. As 4,274,755 tons of ore ... moved after Nov. 1 last year, ... quite clear that the total mov... for the present year will be wel... 41,000,000 tons. In fact, with ... shipments added, the total mov... is quite likely to be nearer 43,0... tons than 42,500,000. These figur... certainly tremendous and prov... capacity of lake equipment to owed easily with the enormous volun... imtrade offered. Following are the since ments by ports: ...pply ... size



REIS-SMITH FEED WATER FILTER AND GREASE EXTRACTOR.

Port—	Oct. 1906.		
Escanaba	697,06	atter	
Marquette	363,48		
Ashland	413,02	o be	
Superior	904,571		
Duluth	1,620,828		
Two Harbors	1,063,817		
	5,062,794	100.00	6,482,654	100.00

Port—	To Nov. 1, 1906.	Per cent of total.	To Nov. 1, 1907.	Per cent of total.
Escanaba	4,976,360	14.94	5,253,043	14.19
Marquette	2,509,286	7.55	2,701,812	7.30
Ashland	3,049,054	9.17	3,103,838	8.38
Superior	5,352,745	16.11	6,747,945	18.20
Duluth	9,955,216	29.96	11,908,539	32.12
Two Harbors	7,405,174	22.27	7,326,684	19.79
	33,238,835	100.00	37,041,861	100.00

REIS-SMITH COLLISION.

The steamer Wm. E. Reis, belonging to the Mitchell fleet, and the steamer Monroe C. Smith of the United States Transportation Co.'s fleet, collided head on in the St. Clair river opposite Algonac last Friday night. Both steamers are very badly damaged, and will be out of commission for the balance of the season. The Reis was sent to the bottom in 26 ft. of water and has a hole about 18 ft. long on the port side just back of the bow. The current has cut under her and she has a decided list to starboard. The steamer is loaded with about 6,500 tons of soft ore. Capt. Harris W. Baker, of Detroit, has been awarded the contract for raising the Reis, at a cost of $22,000. Wrecking operations will be begun immediately.

The steamer Smith was badly damaged and it will take some time to make repairs upon her. She has a hole about 6 ft. long and 8 ft. wide on her port side, her stern is badly twisted and for quite a distance the plates are torn away. Her forepeak

that the ordinary separator, removing the oil by centrifugal force, dashing it against baffles, etc., would be an ideal method of elimination. Yet it has many disadvantages, the greatest of which is that it may not remove all the oil; some will find its way to the hot well or receiver. A sep-

IRON SITUATION.

A weakness approximating $1 a ton has developed in Bessemer pig iron, and the situation is generally one of dullness. The acquirement of the Tennessee Coal, Iron & Railroad Co. by the United States Steel Corporation, is expected to strengthen the iron position, particularly in the south. Although there are signs of weakness in some finished lines, particularly in steel bars and plates, large producers are holding quotations firm and declare reductions will not be forthcoming. Cast iron pipe is quoted at $1 a ton lower. The monthly pig iron statistics of *The Iron Trade Review* for October show a grand

The surest way is to extract the oil from the water by passing all this water through filtering material in the line between the feed pump and the boiler. Linen Terry is generally conceded to be the best obtainable filtering material, and has come into extended use in this country and abroad, both in stationary and in marine plants. It is used on warships of the American, British, German and other navies and on many merchant vessels.

In Figs. 1 and 2 is shown a typical feed water filter and grease extractor which occupies small space in crowded boiler rooms, and which subjects all entering water to double filtration through layers of Terry.

It removes the oil from condensation, and absorbs or effectually prevents foreign matter from passing, does away with the inconvenience of filtering tanks and incurs practically no expense for maintenance. The double layer of Terry through which all water must pass is easily removable and may be cleaned and used many times.

The filter is placed on the [illegible] has been reported in this vicinity.

RECORD DISPATCH.

The new steamer Wm. A. Hawgood left the South Chicago yard of the American Ship Building Co. on Saturday on her maiden trip up the lakes. It is claimed by officials of the Chicago ship yard that the fastest time ever made at a lake ship yard in getting a vessel ready for service after launching was made on the Hawgood. The steamer was launched on Saturday, Oct. 19, exactly two weeks before she left on her initial trip. The best previous record was made on the steamer Salt Lake City which was launched at South Chicago on August 29, and left the yard on her maiden trip Sept. 19.

The steamer Douglas of the Oscoda & Cleveland Transportation Co.'s fleet of St. Clair, Mich., struck a rock while coming out of False Presque Isle, Lake St. Clair, last Thursday and sank. The steamer is in bad shape. Capt. Harris W. Baker has been awarded contract for raising the steamer.

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It is not generally known that there are 39.90 miles of water front in Manhattan, 105.60 miles in the Bronx, 132.30 miles in Brooklyn, 116 miles in Queens and 51 in Richmond, making a total length of water front for Greater New York of 444.80 miles, of which 315 miles are available for ocean traffic. Of the 39.90 miles of water front in Manhattan, 24.68 are owned by the city and 15.22 by private parties; 6¾ miles of river wall have been constructed in Manhattan, and over half a mile in Brooklyn. The trans-Atlantic steamships occupy a length on the water front of 1.27 miles, and over six miles of wharfage room, in Manhattan alone. The coastwise steamships occupy a length of 1.38 miles of water front, equal to 8.16 miles of wharfage room. Railroads, including railroad ferries, occupy a length of 3.56 miles on the water front, or about 18 miles of wharfage room. Other classes of ferries occupy 0.61 mile of water front, and there is used for miscellaneous wharfage a length of 8.77 miles, or 23.59 miles of wharfage room. There are 52.39 miles of wharfage room owned by the city in the borough of Manhattan, and 7,403,637 square ft. of pier area. There is reserved in Manhattan 7.01 miles of water front for park purposes.

USE OF OIL IN STORMS.

The use of oil on water does not appear to be appreciated as greatly as it should, though its efficacy has been known since biblical times. The hydrographic office has issued a monograph on the subject and it would be well for every vessel owner to obtain copies of it for distribution among his masters. Recently the Kaiser Wilhelm der Grosse, one of the finest steamships in the world, lost her rudder during a gale which rapidly developed into a hurricane, making a heavy and dangerous sea. The captain poured oil on the water, forming a coating over the rollers which prevented their breaking over the vessel and enabled him to steer her with her propellers. Capt. H. H. Parsons, of the steamer Sheadle, recently made the remark that he believed the Mataafa, or at least her crew, could

have been saved if a barrel or two of oil had been poured into the Duluth ship canal and permitted to distribute itself over the surface of the water. But nobody thought of it. It would be well for every vessel to carry a quantity of storm oil.

IRON ORE SHIPMENTS

The October movement of c certainly surprising, as it comes v 324,156 tons of equaling the r breaking month of the present During October 6,482,654 tons moved, as against 6,806,810 tor August, last. The total moveme to Nov. 1 is 37,041,861 tons, wh only 471,728 tons below the movement for the whole seas 1906. As 4,274,755 tons of ore moved after Nov. 1 last year, quite clear that the total mov for the present year will be wel 41,000,000 tons. In fact, with a shipments added, the total mov is quite likely to be nearer 43,0 tons than 42,500,000. These figur certainly tremendous and prov capacity of lake equipment to easily with the enormous volun trade offered. Following are the ments by ports:

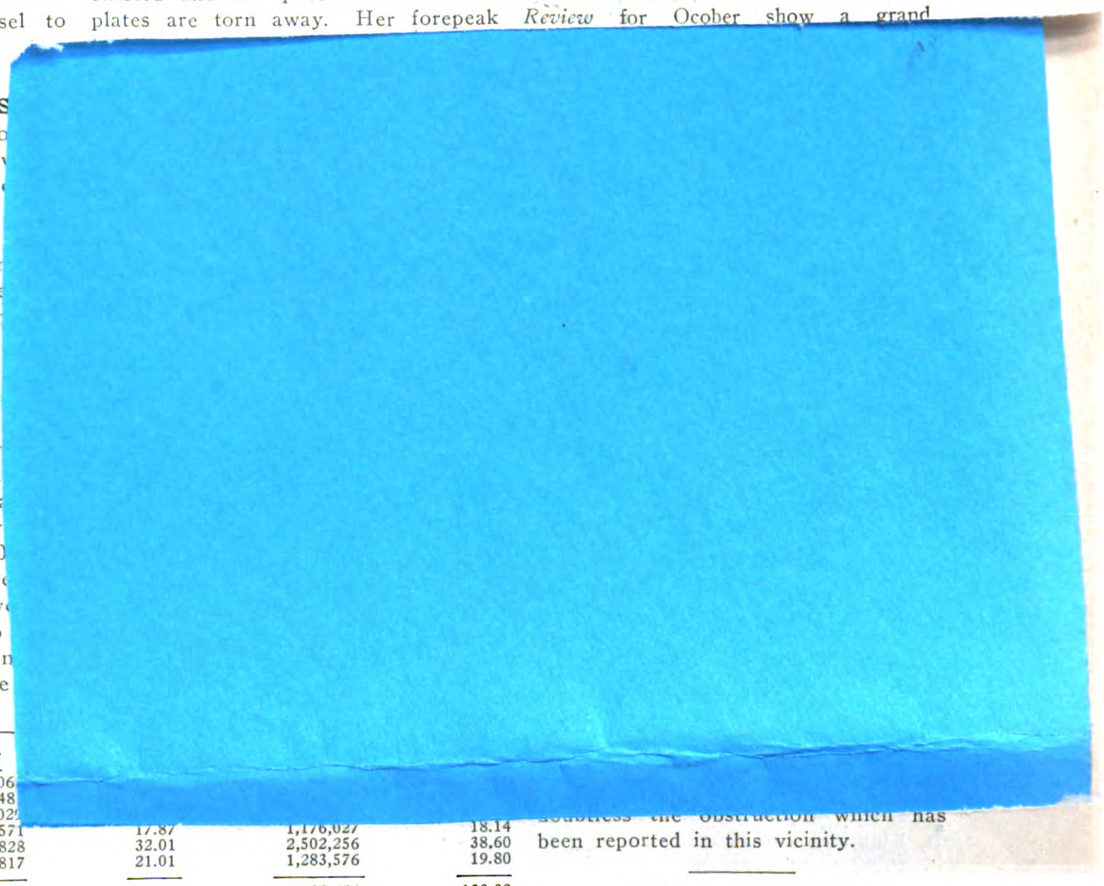
Port—	Oct. 1906.			
Escanaba	697,06			
Marquette	363,48			
Ashland	413,02			
Superior	904,571	17.87	1,176,027	18.14
Duluth	1,620,828	32.01	2,502,256	38.60
Two Harbors	1,063,817	21.01	1,283,576	19.80
	5,062,794	100.00	6,482,654	100.00

Port—	To Nov. 1, 1906.	Per cent of total.	To Nov. 1, 1907.	Per cent of total.
Escanaba	4,976,360	14.94	5,253,043	14.19
Marquette	2,509,286	7.55	2,701,812	7.30
Ashland	3,049,054	9.17	3,103,838	8.38
Superior	5,352,745	16.11	6,747,945	18.20
Duluth	9,955,216	29.96	11,908,539	32.12
Two Harbors	7,405,174	22.27	7,326,684	19.79
	33,238,835	100.00	37,041,861	100.00

REIS-SMITH COLLISION.

The steamer Wm. E. Reis, belonging to the Mitchell fleet, and the steamer Monroe C. Smith of the United States Transportation Co.'s fleet, collided head on in the St. Clair river opposite Algonac last Friday night. Both steamers are very badly damaged, and will be out of commission for the balance of the season. The Reis was sent to the bottom in 26 ft. of water and has a hole about 18 ft. long on the port side just back of the bow. The current has cut under her and she has a decided list to starboard. The steamer is loaded with about 6,500 tons of soft ore. Capt. Harris W. Baker, of Detroit, has been awarded the contract for raising the Reis, at a cost of $22,000. Wrecking operations will be begun immediately.

The steamer Smith was badly damaged and it will take some time to make repairs upon her. She has a hole about 6 ft. long and 8 ft. wide on her port side, her stern is badly twisted and for quite a distance the plates are torn away. Her forepeak



doubtless the obstruction which has been reported in this vicinity.

RECORD DISPATCH.

The new steamer Wm. A. Hawgood left the South Chicago yard of the American Ship Building Co. on Saturday on her maiden trip up the lakes. It is claimed by officials of the Chicago ship yard that the fastest time ever made at a lake ship yard in getting a vessel ready for service after launching was made on the Hawgood. The steamer was launched on Saturday, Oct. 19, exactly two weeks before she left on her initial trip. The best previous record was made on the steamer Salt Lake City which was launched at South Chicago on August 29, and left the yard on her maiden trip Sept. 19.

IRON SITUATION.

A weakness approximating $1 a ton has developed in Bessemer pig iron, and the situation is generally one of dullness. The acquirement of the Tennessee Coal, Iron & Railroad Co. by the United States Steel Corporation, is expected to strengthen the iron position, particularly in the south. Although there are signs of weakness in some finished lines, particularly in steel bars and plates, large producers are holding quotations firm and declare reductions will not be forthcoming. Cast iron pipe is quoted at $1 a ton lower. The monthly pig iron statistics of *The Iron Trade Review* for Ocober show a grand

lakes. The MARINE REVIEW expects to be able to give plans and cuts of the new machines in the near future. The Pittsburg Coal Co. has further additions to its dock capacity in Duluth in contemplation for next season. Their plans for this work, however, are not far enough advanced for publication at the present writing.

The steamer Douglas of the Oscoda & Cleveland Transportation Co.'s fleet of St. Clair, Mich., struck a rock while coming out of False Presque Isle, Lake St. Clair, last Thursday and sank. The steamer is in bad shape. Capt. Harris W. Baker has been awarded contract for raising the steamer.

CAR FERRY ONTARIO NO. 1.

Car Ferry Ontario No. 1, operated by the Ontario Car Ferry Co. on Lake Ontario, has had quite a successful season. This car ferry was described in the issue of the MARINE REVIEW of May 2, but this is the first

[redacted]

1 in. over all, 54 ft. beam molded, 50 ft. beam over main deck, 20 ft. 6 in. depth of mold, 37 ft. 6 in. depth from shade deck. The car ferry is of the ice-breaking type and has a capacity of 28 loaded cars on a loaded draught of 15 ft. Her engines, operating twin screws, are triple-expansion with cylinders 20½, 32½ and 54 in. diameters, with a stroke of 36 in. Her air pumps and condensers are of the Dean Bros. manufacture, and bilge and feed pumps of the Blake type. Her electrical equipment was supplied by the General Electric Co. She carries an emergency steam steerer manufactured by the Akers Steering Gear Co. of Chicago.

FORE RIVER TONNAGE.

Ten vessels launched by this company during the year 1907, including two submarines and two cruisers for the United States. The record of the Fore River Ship Building Co. of Quincy, Mass., for the year 1907, shows ten vessels launched or to be launched. Two of these are submarines and two are scout cruisers built for the United States navy; four vessels will be used in the freight service and two smaller craft, a lighter and a tug, will be used in harbor work by the New England Steamship Co. In addition to this the company has in work on hand one United States battleship, the North Dakota, of a displacement of 20,000 tons and four United States light vessels.

[redacted]

England have been delivered and are now in service. It is expected that the collier Malden will be delivered and in service within a month. The following is a summary of vessels launched and to be launched at Fore River during the year 1907:

Name of Vessel.	Type.	Board of Trade. Tons, gross.	I. H. P.	Makers. Engines.	Port of Registry.
Viper	U. S. Submarine	170 tons displacement	B. H. P. 250		
Tarantula	U. S. Submarine	170 tons displacement	B. H. P. 250		
Everett	Collier	3,750 gross tons	I. H. P. 2,700	Fore River Shipbuilding Co.	Boston
Malden	Collier	3,750 gross tons	I. H. P. 2,700	Fore River Shipbuilding Co.	Boston
Melrose	Collier	3,750	I. H. P. 2,700	Fore River Shipbuilding Co.	Boston
Salem	U. S. Scout Cruiser	Displacement 3,750 gross tons	B. H. P. 16,000	Fore River Shipbuilding Co. (Curtis turb.)	
Birmingham	U. S. Scout Cruiser	Displacement 3,750	B. H. P. 16,000	Fore River Shipbuilding Co. (Reciprocating)	
Altamaha	Freighter	2,667 gross tons	I. H. P. 1,200	Fore River Shipbuilding Co.	Brunswick, Ga.
New England	Lighter	417 gross tons	I. H. P. 400	Fore River Shipbuilding Co.	New London, Conn.
(Not named)	Tug	425 gross tons	I. H. P.	Fore River Shipbuilding Co.	New London, Conn.

Work on hand. One—United States battleship, 20,000 tons displacement and four United States light vessels.

MOTOR LAUNCHES FOR CHINA.

We illustrate in this issue on pages 44 and 45 the eight launches recently shipped to Tientsin by Messrs. John I. Thornycroft & Co., Ltd., of Chiswick. The photo shows the various arrangements of hoods, awning, etc., and the smart as well as workmanlike appearance of the boats. They are of this firm's standard pattern, carvel built of mahogany, copper fastened throughout. Their dimensions are 25 [illegible] long by 5 ft. 6 in. beam, 4 ft. [illegible]h, and 1 ft. 5 in. draft, thus mak[illegible]very good sea-going boats, as was [illegible]nced during the 1906 reliability [illegible] in the Solvent, when Veradaise [illegible] the same type won the Autocar [illegible]or the most meritorious perform[illegible] irrespective of class, a gold [illegible], and an All British award. It [illegible] moreover, accounted the most [illegible]rthy boat in its class.

[illegible]e motors are the Thornycroft 6 [illegible]. P. type, fitted with reversing [illegible] and solid propeller. This motor [illegible]apted for using petrol or paraffin [illegible]sired by means of the very in[illegible]us device now being used by [illegible] builders for the purpose.

[illegible] average speed with and against [illegible]nt of eight miles an hour was at[illegible]d on the trials in the Thames, [illegible] which the boats were packed [illegible]ately in crates and shipped to [illegible] destination.

[illegible]is particular type of launch is be[illegible]ng more and more popular as [illegible]rs to large ships and yachts, as [illegible] boats, as well as for the more [illegible] sea cruising and other pleasure [illegible]poses. Its light draft causes it to be equally as serviceable up river as its dryness and great steadiness in choppy water recommends it for sea work. Messrs. Thornycroft have a number of similar craft in hand at present for various parts of the world.

The battleships which are to go to the Pacific are to be fitted with crow's nests for use as observation places in connection with the new fire control installations.

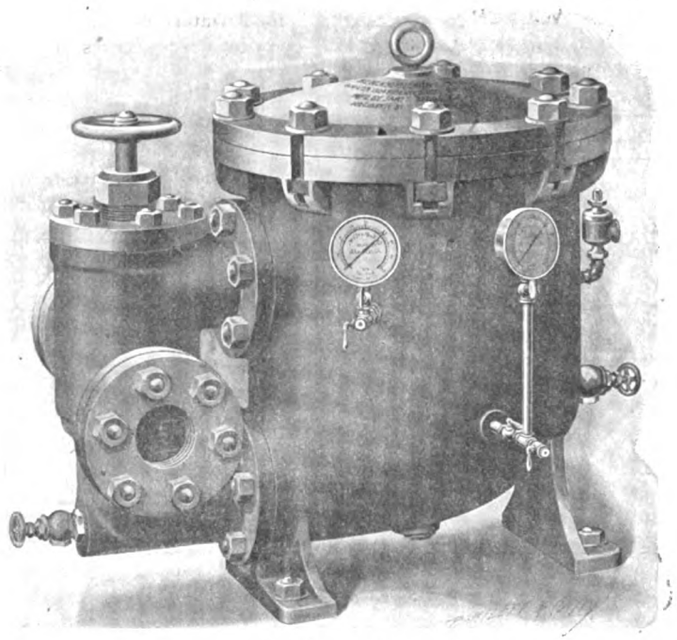


FIG. 1.—THE BLACKBURN-SMITH FEED WATER FILTER AND GREASE EXTRACTOR.

process is slow and must be allowed to take its time. It is, therefore, impracticable in large plants, since tanks to give ample water supply would be so large that their size would be prohibitive.

If mud, sand and organic matter contained in the feed water are to be removed rapidly to furnish large quantities of water, some kind of filtration is essential. One method is to provide tanks with perforated false bottom on which are placed coke, gravel, charcoal, hay or burlap, or a combination of these. The water passes through these materials and into a chamber from which it is withdrawn by the feed pumps. The only head of water available in these filters to force the water through the filter bed is that due to gravity, and the percolation is therefore very slow, and as the filter becomes clogged up it ceases altogether. Moreover these filters are imperfect in their action, as the openings for the passage of water are necessarily larger to obviate interference with the flow. But here again the action is dependent upon the weight of the water. The principal difficulty, however, lies in renewing the filtering material, which has to be done frequently. The filter beds are so large that changing of the filtering material is a formidable job, to be attempted only when the plant is shut down, and as a result the filters are often clogged up and out of service.

On first thought it would seem that the ordinary separator, removing the oil by centrifugal force, dashing it against baffles, etc., would be an ideal method of elimination. Yet it has many disadvantages, the greatest of which is that it may not remove all the oil; some will find its way to the hot well or receiver. A separator in the exhaust pipe obviously adds back pressure on the engine and must be bulky to handle freely the heavy flow in large mains. Condensation of steam also occurs during separation, and much feed water is lost with the separated oil unless a further separation of the "emulsion" is effected.

The surest way is to extract the oil from the water by passing all this water through filtering material in the line between the feed pump and the boiler. Linen Terry is generally conceded to be the best obtainable filtering material, and has come into extended use in this country and abroad, both in stationary and in marine plants. It is used on warships of the American, British, German and other navies and on many merchant vessels.

In Figs. 1 and 2 is shown a typical feed water filter and grease extractor which occupies small space in crowded boiler rooms, and which subjects all entering water to double filtration through layers of Terry.

It removes the oil from condensation, and absorbs or effectually prevents foreign matter from passing, does away with the inconvenience of filtering tanks and incurs practically no expense for maintenance. The double layer of Terry through which all water must pass is easily removable and may be cleaned and used many times.

The filter is placed preferably in the feed line between the pump and boiler, Fig. 3, so that any desired

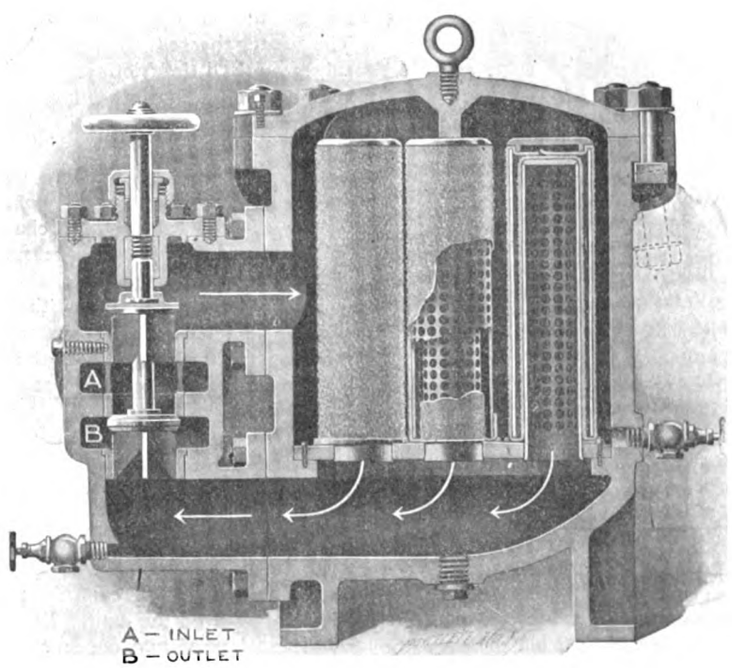


FIG. 2.—SECTIONAL VIEW OF FILTER.

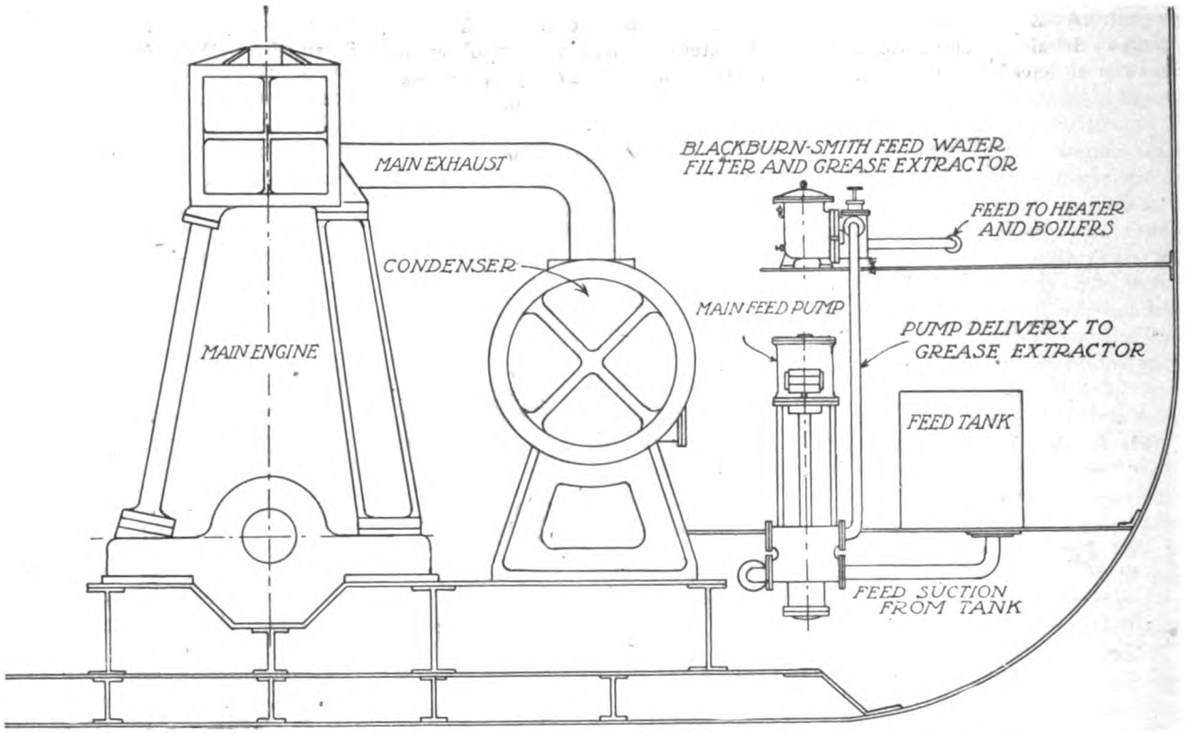
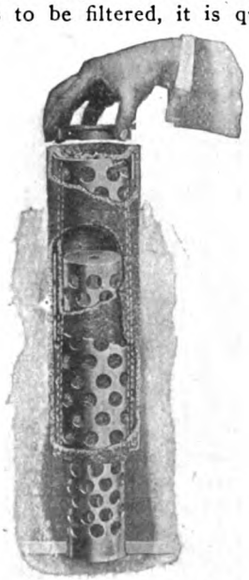


FIG. 3.—THE BLACKBURN-SMITH FEED WATER FILTER AND GREASE EXTRACTOR ON SHIPBOARD.
The Filter is located in the feed line between the feed pump and heater.

pressure may be used to force the water through the filtering material. Where a closed heater is used the feed water should first pass through the filter, in order that the matter in suspension may not adhere to the surfaces of the heater and impair their heat transmitting properties. Where an exceptionally large quantity of water is to be filtered, it is quite an



REPLACING THE FILTERING MEDIA.

advantage to have a battery of filters, any one or all of which may be placed in service or cut out at will. By having two filters one may be by-passed and cleaned, while the other goes on supplying the boilers with clean water.

Referring to cross sectional view, Fig. 2, of a Blackburn-Smith filter, built by James Beggs & Co., of New York, water from the feed pump enters the inlet, passes into the upper or filtering chamber, through the filtering cartridges, into the bottom chamber and thence through the outlet to the closed heater or boiler. The water passes through the cartridges with little friction, but, in the course of time, as the foreign matter accumulates on the filtering material, some resistance will result. This resistance is shown by the reading of pressure gages connected to the filtering and outlet chambers. When the difference of pressure, as shown by the gages, increases to 20 pounds per square inch, the filter should be cleaned. A water relief valve automatically prevents the building up of excessive pressure in the pump discharge line.

All the main valves are on one stem and one movement of the hand wheel causes the filter to be put in operation or by-passed. The lower disk is double beat, and its position determines the flow through the filter. The number of cartridges varies with the size of the unit. Each cartridge consists of two concentric cylinders of heavy perforated brass tubing covered with linen Terry. The filtering media conform to the shape of the cartridges, the closed end being drawn down to a nice fit over the inner cylinder, reversed over the outer cylinder, and the other end tucked in and clamped by a brass cap. This construction compels a double filtration so that any matter which gets through the first layer of Terry is sure to be caught in the second layer.

Those who have worked in crowded plants or around the machinery of steamships or have kept big filtering tanks in order will appreciate the speed and comfort with which the filtering media of this type of filter may be changed when foul. The foul media should be boiled in water and soda so as to be ready for the next cleaning.

The heavy impurities which may cling to the walls of the filtering chamber or settle to the bottom may be blown out by opening a sludge valve. The frequency of this, as of the other cleaning operations, varies according to conditions peculiar to each plant, and the cleaning periods are easily determined after a short operation.

The capacity of such a filter varies according to the amount of surface of filtering material. In the Blackburn-Smith filter 7,500 pounds of water per hour may be filtered through a 1½-inch feed line, and the quantity increases up to 250,000 pounds per hour for a 6-inch line.

TRADE NOTES.

The New Britain Machine Co., New Britain, Conn., have recently issued a very attractive catalog devoted to the New Britain dado machine for reducing costs on window frames.

The Fort Wayne Electric Works, Fort Wayne, Ind., has just put out bulletins descriptive of portable wattmeter calibrators, enclosed direct current multiple arc lamps, and multiple system of street arc lighting.

The Independent Pneumatic Tool Co., First National Bank building, Chicago, has issued catalog No. 8 superceding all former issues descriptive of Thor pneumatic tools. The company reports that Thor tools are coming in greater favor every day.

The 1907 catalog of D. Saunders' Sons, Inc., Atherton street, Yonkers, N. Y., manufacturers of pipe threading machinery, is very complete upon its special subject and should be in the library of every manufacturer interested in pipe threading machinery.

The Trimont Manufacturing Co., 15-27 Amory street, Roxbury, Mass., have just put out a catalog in which is described the Trimont pipe tools and accessories. The catalog is a practical price list of wrenches, wrench parts, pipe covers and pipe cover parts.

The New Britain Machine Co., New Britain, Conn., have just issued a little catalog descriptive of the chain saw mortiser and say for it that it will mortise faster than any other machine and that its work is straight and true. This catalog is a good example of the printer's art and is attractively bound.

The Jerguson Mfg. Co., successors to Wm. T. Bonner Co., 221 Columbus avenue, Boston, Mass., has just issued a little catalog devoted to engineering specialties and Klinger reflex water gages. In the Klinger reflex water gage the water appears black while the steam shines with a silvery lustre. With this gage it is impossible to make a mistake.

The Stow Flexible Shaft Co., Philadelphia, Pa., has put out a catalog descriptive of Stow flexible shafts, portable motors, drills, grinders, polishers, tools, engines and machines. The descriptive matter in this book concerning the Stow flexible shaft is quite interesting and the uses to which it can be put are infinite. The catalog is very clearly illustrated.

The Anderson Forge & Machine Co., Detroit, Mich., has recently issued a booklet on forgings. Especial attention is called to the notes on vanadium steel. The company is using considerable vanadium steel in making various kinds of forgings. The splendid working of vanadium steel under constant vibration appeals to all who are interested in the manufacture of engines, automobiles and other machinery. The company will gladly send the booklet to anyone interested in this subject. The catalog is finely illustrated with forgings and automobile parts.

The Russell, Burdsall & Ward Bolt & Nut Co., of Port Chester, N. Y., have issued a catalog devoted to their output. The catalog goes about its business very thoroughly and is crowded almost from the first page to the last with sizes and prices of bolts and nuts. The illustrations are confined to the concluding pages.

The Allis-Chalmers Co., Milwaukee, Wis., has put out a bulletin devoted to the Type J emergency valve for straight air brake equipments. This emergency valve was designed to improve deficiencies in the straight air brake system, allowing the conductor to apply the brake in case of emergency from any one of the cars of the train.

The Norwalk Iron Works Co., South Norwalk, Conn., has recently issued a catalog descriptive of the Norwalk air and gas compressor. The Norwalk air compressors are used pretty generally throughout the entire country. Their advantages are dry air, high speed, light weight and full air supply. The catalog is illustrated with both line and wash drawings.

The Crane Co., Chicago, Ill., has just put out a general catalog descriptive of Crane valves and fittings for ammonia. This catalog is a book in itself, but of most convenient size. It covers its subject quite completely and no review could do justice to it. Information is given in great detail, not only as to size and price, but in description as well.

The DeLaval Steam Turbine Co., Trenton, N. J., has put out a little booklet briefly describing the different types of high grade turbine and motor-driven machinery manufactured by the company, including the DeLaval steam turbine, DeLaval direct current dynamos, DeLaval steam turbine motors and DeLaval pumps. The catalog is compact and is worth having.

The Hisey-Wolf Machine Co., Cincinnati, O., have just issued a catalog descriptive of portable electric tools, notably drills and grinders. The company claims to be the originators and largest builders of portable electric tools in the world. The catalog is nicely printed and is well worth writing for by those interested in these devices.

The Randall Tramrail Co., Trenton and Allegheny avenues, Philadelphia, Pa., has just put out a catalog descriptive of overhead tracking. This catalog largely consists of full-page illustrations showing the adaptability of the tramrail in foundry practice and the factory and shop. The company is prepared to adapt its system to any specifications submitted.

A new, handsomely bound and illustrated catalog devoted to the marine uses of the paints and varnishes manufactured by the Sherwin-Williams Co., of Cleveland, has recently been issued. The volume shows a specific protector for each and every ravage of wind and wave. Sherwin-Williams paints "cover the earth" and put color in the sea.

The Mason Regulator Co., Boston, Mass., has issued a catalog descriptive of their regulating devices. The catalog opens with a general description of the Mason all bronze reducing valves with copious illustrations. Descriptions are also given of the Mason boiler feed pump and receiver, the Mason improved steam pump, the Mason hydraulic damper regulator. This catalog is extremely well printed.

The Keuffel & Esser Co., 127 Fulton street, New York, manufacturers and importers of drawing materials and surveying instruments, have issued a very complete catalog of their products. The surveying instruments include nautical instruments and comprise a very complete list. The catalog is illustrated with over 400 cuts and comprises altogether a very compact book of 532 pages.

The Horsburgh & Scott Co., 5114 Hamilton avenue, Cleveland, manufacturers of Peerless raw hide gearing, has just put on a catalog descriptive of their products. Raw hide gearing has been one of the specialties of this company for the last 20 years. The company is also manufacturers of all kinds of metal cut gears. The catalog is abundantly illustrated with section plans and halftones.

The Billings & Spencer Co., Hartford, Conn., manufacturers of and dealers in machinists' tools and drop forgings of every description in copper, bronze, iron and steel, have sent out a catalog of their output. A very copious index gives access to the various parts at once and is a mighty convenient arrangement, as the list of tools is considerable. A price list is given and the catalog is practically invaluable.

Judson G. Wall, 10 Wall street, New York, has issued a little folder descriptive of the Unique Smoke Consuming System. By this system all smoke and gas is drawn from the front part of the fire-box into the flues where it is thoroughly mixed under pressure with an

abundant supply of oxygen. It is then brought to a very lightly heated condition and forced into the back part of the fire-box above the fire. It is said to eliminate smoke altogether.

The McNab & Harlan Mfg. Co., 56 John street, New York, recently put out the ninth edition of their illustrated catalog. This catalog supercedes all previous issues. It is a well-made book of nearly 300 pages describing pipe, iron pipe fittings, drainage fittings, flanged fittings, brass valves, brass fittings, iron body work, gas fixture fittings and all specialties manufactured by the company. This book should be in the library of everyone interested in the subject.

The New Britain Machine Co., New Britain, Conn., have put out an attractive catalog descriptive of the Case automatic high speed steam engine. This engine has been manufactured for the past 15 years and as the company believes a thorough examination of it will make friends and purchasers, has described it minutely in the catalog, illustrating the letter press matter with copious drawings, both line and wash. Anyone interested in this type of engine would do well to write for the catalog.

The Termaat & Monahan Co., Oshkosh, Wis., has issued a little catalog devoted to the Termaat & Monahan marine engines, all of which operate on the two-cycle principle. These engines are built of the best material throughout and are fully guaranteed by the company. The catalog contains a complete description of the engine, as well as individual parts, illustrated with wash and line drawings. The engines appear to be quite reasonably priced and anyone interested is advised to become acquainted.

The Allis-Chalmers Co., Milwaukee, Wis., has just put out a pamphlet descriptive of the Type OB pneumatic governor. The company speaks in the highest terms of this air brake equipment. Prior to the placing of a very large order it was given an exhaustive test by the engineering department of the Manhattan Elevated Railway of New York City, in a series of 284,000 continuous operations breaking a current of 24 to 35 amperes at 600 volts without any attention whatever during the entire period of the test.

The Akers Steering Gear Co. has received an order from John J. Barlum, trustee for the steamer Thomas Barlum, now building at the Wyandotte yard of the American Ship Building Co., to equip the steamer with the Akers emergency steam steering gear. An order has also been received from Edward Mehl, of Erie, to equip the steamer which is to be built this winter at the Wyandotte yard with the Akers emergency steering gear.

Elisha Webb & Son Co. announces its removal to 136 South Front street, Philadelphia, Pa. These quarters have been greatly remodeled and improved and the company has added two new features to its business. To the supplies department has been added a complete line of staple and fancy groceries and stores for ship's use. To the mechanical department a complete line of ships' plumbing fixtures has been added.

The Croeschell Brothers Ice Machine Co., 29-39 East Erie street, Chicago, Ill., have just issued a catalog descriptive of their carbonic anhydride ice and refrigerating machinery. The advantage of the carbonic and refrigerating machine is represented to be that it is more compact and requires less space than other refrigerating machines, that it is simple of construction and easy to operate. The machine is thoroughly guaranteed. Quite a number of testimonials of its efficiency are given.

The North American Dredging Co., Merchants Exchange building, San Francisco, has issued a catalog which is quite generously filled with illustrations of work performed by the company. This company is equipped with the most modern dredging plants and is prepared to make river and harbor improvements in any part of the world. The plant has an excavating capacity of 2,000,000 cu. yds. of earth per month. The company is consulting engineer for all kinds of river and harbor work, levees, earth dams, river protection, reservoirs, irrigation and drainage canals.

The Williamson Bros. Co., Philadelphia, Pa., engineers, founders and machinists, have recently issued a catalog of high grade condensing equipments for producing high vacuum. The company will submit the size and kind of condensing equipment best adapted for individual service upon receiving data. The catalog opens with a description of the company's type of surfacing condenser, which is well described both in letter press and illustration. Descriptions of jet condensers, ejector condensers and turbine condensers follow. Part of the catalog is also devoted to cooling towers.

The Brown & Sharpe Mfg. Co., Providence, R. I., have issued a comprehensive catalog of their machinery and tools. While it is a size convenient to the hand, it nevertheless contains 500 pages of closely printed matter. The catalog is very carefully indexed, the index in itself occupying nearly twenty pages. This company has been in business since 1833 as manufacturers of milling machines, grinding machines, automatic general cutting machines, screw machines, cutters, test tools and machinist tools. This catalog is so comprehensive that it would be well for everyone to have it on file.

The Morse Twist Drill & Machine Co., New Bedford, Mass., makers of increase and constant angle twist drills, reamers, chucks, milling cutters, taps, dies machinery and machinists' tools, has issued a general catalog, the largest and most complete ever issued by the company. Among the new tools illustrated are shell drills, indexed cases for sets of drills, counterbores with interchangeable blades and guides, adjustable caliper gages, standard reference disks, Cotter mills, gear cutters, gear testing machine, bench center and straightening press. The catalog contains an unusually complete index so that everything is instantaneously accessible. Sizes including price list are invariably given.

The Whitlock Coil Pipe Co., Hartford, Conn., have just issued a general catalog which has been quite sumptuously prepared. The catalog is complete for all departments which include the coil department, the pipe department, the big bend department, the automobile department, the plumbers' supply department, the heater department and the brass foundry. Each department is handled separately so that the catalog approaches the dimensions of a considerable book, and moreover a well illustrated and well printed one. In fact better wash drawings we have rarely seen. The company manufactures all kinds of coils and bends of iron, steel, brass or copper pipe or tube for all purposes including heating, cooling, refrigeration, conduit and pneumatic service. They are national jobbers of merchant pipe and always carry a stock of all sizes for prompt delivery. They are manufacturers of bent and flanged pipe for high pressure power plant and steamship piping in all sizes up to 30 in. diameter. They are manufacturers of the American Standard Copper Coil Feed Water Heater, the American Berryman, special heaters, separators and exhaust pipes. Those interested would do well to write for this catalog which is well worth preserving.

The company completed its new plant this year and now has the largest and most modern pipe bending establishment in the country. They are prepared to make prompt quotations and quick deliveries on specifications for high pressure of special pipe work, bends and coils of every description made of iron, steel, brass or copper pipe or tubing ranging in size from ⅛ in. to 30 in.

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The Star indicates alternate insertions, the Dagger once a month.

CLASSIFIED ADVERTISING SERVICE

PROPOSALS.

U. S. Engineer Office, Detroit, Mich., Oct. 8, 1907. Sealed proposals for rock and earth excavation at Section 3, Plan B, Detroit river, will be received at this office until 3 P. M., Nov. 20, 1907, and then publicly opened. Information furnished on application. Chas. E. L. B. Davis, Colonel, Engineers.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., Oct. 21, 1907. Sealed proposals for dredging at Muskegon Harbor, Mich., will be received here until 3 P. M., Nov. 20, 1907, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., Oct. 21, 1907. Sealed proposals for construction of breakwaters at Ludington, Mich., will be received here until 3 P. M., Nov. 20, 1907, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

TUG BOAT WANTED

TUG WANTED, power equivalent to 20 x 24 engines. Must have good hull. State name of boat and pressure allowed, whether in commission or how long out. Greiling Bros., Green Bay, Wis.

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STEAMER "CAYUGA" FOR SALE, cheap, or will exchange for good gasoline boat in half payment. Inquire of I. L. Lanford, Montague, Mich.

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ONE 7½-INCH — 17-INCH x 10-inch fore and aft Vertical Compound Marine Engine, for sale, Reeves make, at a bargain; in first class condition; used only short time. Would exchange for a smaller one of size 6 inch—12 inch x 8 inch. For particulars apply to Morris Sherman Mfg. Co., Chattanooga, Tenn.

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